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The Olney Medal is to be awarded for outstanding achievement in the field of textile chemistry, which is understood to include the development of chemical agents or chemical processes used in the manufacture of textiles or methods for their evaluation. In making awards, the Committee need not be confined to the consideration of any one specific achievement or contribution, but may in its discretion consider the sum total of various and continued contributions to the field, no matter of how long duration. Any citizen of the United States of America, whether male or female, may be the recipient of the award.

Any Senior member of the American Association of Textile Chemists and Colorists may nominate a candidate for receipt of the award by letter addressed to the Olney Medal Committee of Award, care of the Secretary, Box 28, Lowell, Mass. This letter shall set forth in detail all facts which qualify the candidate for consideration, with particular reference to published works and professional qualifications.

It is requested that five copies of each letter be submitted, or single copy on one sheet suitable for photographic reproduction and distribution to the five voting members of the Committee of Award.

CALENDAR OF COMING EVENTS

Meeting, Northern New England Section, March 16, 1945. Speaker: Daniel Knowland, Geigy Co., "Idiosyncrasies in Color Matching by Young and Old."

Meeting, New York Section, Downtown Athletic Club, New York City, March 16, 1945. Symposium on "Recent Developments in Finishing and their Application to Fabrics." Speakers will be Capt. Goodavage and Messrs. Ackley and Nute.

Meeting, Rhode Island Section, Providence Engineering Society Hall, 195 Angell Street, Providence, R. I., March 23, 1945. Speaker: Hector C. Borghetty, General Dyestuff Corp., "Postwar Possibilities in Finishing Fabrics."

Meeting, Council, Providence Engineering Society Hall, 195 Angell Street, Providence, R. I., March 23, 1945.

Meeting, Research Committee, Providence Engineering Society Hall, 195 Angell Street, Providence, R. I., March 23, 1945.

Meeting, Philadelphia Section, April 20, 1945.

OTHER ASSOCIATION MEETINGS

Meeting, A.A.T.T., Builders Club, New York City, April 4, 1945.

COTTON GROUP MEETING*

(Concluded from last issue)

DOUGLAS C. NEWMAN

Presiding

CHAIRMAN NEWMAN: We will proceed with the next paper. We will now go from the subject of dyeing to the subject of drying.

The next paper is entitled, "Recent Developments in the Drying of Textile Materials." It will be presented by Mr. C. Norris Rabold, Chief Chemist of the Union Bleachery of Greenville, South Carolina.

. . . Mr. Rabold presented his prepared paper . . .

RECENT DEVELOPMENTS IN THE DRYING OF TEXTILE MATERIALS*

C. NORRIS RABOLD

OUR purpose, in this paper, is to briefly present the latest trends in textile drying. A great deal has been written and published about new drying methods. We plan to discuss the various methods now in use, indicating their present status, possible trends in their future development and advantages and disadvantages.

The speaker does not pretend to possess a profound knowledge of drying, thus our information and the ideas presented have been secured from the leading manufacturers of drying equipment and from drying engineers of recognized ability.

When one speaks of drying, his thoughts immediately turn to the evaporation of water. Removal of water from textile materials does constitute the vast bulk of drying, but there are now being used, in ever increasing quantities, synthetic resins, pigment-printing and dyeing formulations, durable water-repellent finishes, and other compounds. We now not only evaporate water but also vaporize solvents; polymerize resins at high temperatures and volatilize the by-products of chemical reactions.

Therefore, we offer as our definition of drying today: the removal of any volatile substance from a fiber or fabric by means of energy in the form of heat.

Now, as to how this can be done. Anyone who has studied physics remembers under the subject of heat, the terms: conduction, convection and radiation. However, to refresh our memories, it might be well to redefine these expressions, with certain liberties, in terms of textile drying.

Conduction drying requires direct contact between the source of heat and the body to be heated. It might best be illustrated by the drying of cloth on drycans of Sanforizing cylinders.

In convection drying, a gaseous medium, usually air, is employed to transfer heat from its source to the object to be dried. Rawstock and loop driers, hot flues, tenter frames, and curing ovens operate on this principle.

Radiation drying, or radiant-energy drying, as it is more commonly called, makes use of electromagnetic waves in the near infra-red part of the spectrum. These waves travel from their source until they strike a material object where they are partly reflected, partly transmitted and partly absorbed. The part absorbed may be transferred into heat, warming the absorbing body. Infra-red rays, being a form of energy themselves, do not require any material substance for their conductance, nor do they have any warmth in themselves. They pass through gaseous media, glass and certain other materials with little energy loss and can be reflected with slight absorption from highly polished aluminum or gold surfaces.

Dielectric drying, also called high-frequency or radio-frequency drying, is a comparative new-comer to the drying field, though the principle employed has long been known. When a poor conductor of electricity, such as wool, cotton, rayon, or other fiber, is placed between two electrodes connected to an electronic high frequency generator, sufficient resistance is offered to the flow of current to turn a sizable portion of it from electrical energy into heat. This heat energy is generated within and throughout the body of the non-conductor almost immediately. The principle is the same as employed for converting electrical energy to light energy in the incandescent lamp. While light is the desired end result, everyone knows the resistance filaments of these lamps release a sizable quantity of heat, as well.

As textile fibers, water and many solvents are notoriously poor conductors of heat, with both infra-red and dielectric heating, it is possible to start evaporation much sooner than can be done with sensible heat, by convection or conduction methods. Here, there is a distinct lag, during which a certain amount of heat must be used to bring the water or solvents to evaporating temperature.

STEAM DRYING

For many years, steam, produced from coal, oil or gas-fired boilers has been the primary source of heat for drying purposes. The efficiency of boiler plants has had years of careful study since the tremendous requirements of steam generators has permitted the expenditure of almost unlimited sums of money for efficient development. Thus, it is reasonable to suppose that we have, in the modern power plant, one of the lowest cost methods for generating distributable heat units from fuel. It is also reasonable to suppose, with the large investments in boiler plant equipment, that any textile plant would hesitate in discarding their steam plant completely. Also, in plants consuming 20,000 lbs. steam per hour, it is generally more economical for them to make their own power by means of a turbine-generator set-up, than it is to purchase it, which is usually done. So, we have several reasons for the continuance of steam drying.

Drying engineers have been constantly improving steam drying equipment, until the units today are a far cry from those of ten or twenty years ago. For instance, dry cans are now in operation that will

*Presented at Annual Meeting, Atlantic City, N. J., October 14, 1944.

and up to 50 lbs. steam pressure, as against the usual 15 lbs. doubling or tripling drying speeds with the same number of cans. The trend in steam drying, though, seems to be away from conduction to convection systems, thus air drying has moved ahead rapidly. Today, we already have 80 feet tenters, drying cloth at 170 yds./min. or faster, loop, rawstock, and hot flue driers that operate at high speeds with little increase in cost, over older, slower installations. Better insulation of enclosures to lessen heat losses, better methods of air circulation, representing improved aerodynamic and thermal features, appears the trend for the future.

The war's tremendous demand for textiles brought such demands on existing steam plants, many of which in normal times, were already operating at maximum capacity, that other methods of drying received considerable attention. It seens to be the consensus of opinion, that synthetic resins and durable water-repellent finishes can be cured at high temperatures, in the neighborhood of 375° to 400° F, with greater speed, and generally more satisfactory results than at lower temperatures and longer times. Since the average steam plant does not produce steam over 150 lbs. pressure, and usually delivers it to driers at still less pressure, under the best conditions, temperatures of 350° to 360° F., are the maximum possible. As a result, much thought has been given to obtaining the higher temperatures.

INDIRECT-FIRED DRIERS

Today, there are available indirect-fired heaters operating as individual units. These units can be used for both curing and solvent removal, as well as water removal. Careful attention has to be given to oven design, however, if the drier is to perform more than one function. The heater, consisting of a number of burners using either fuel-oil or gas, is located outside the drying unit. In some cases, air, plus the products of combustion, is carried into the drier and circulated by means of fans. In other types, air is only passed over heated surfaces and carried into the drier. If the size of the furnace and drier are properly balanced, high temperatures may be attained.

RADIANT ENERGY DRYING

Probably the earliest use to which this method of drying was put was the solvent removal and polymerizing of lacquers and resins on metallic surfaces. It was found possible, in many cases, to reduce drying time from days to hours, and hours to minutes, as compared to the steam-heated, air-drying chambers then in use. Many additional uses have been developed for infra-red drying, such as pre-heating of metal gears, for better fit, processing of plastics, glass and ceramics, wood lamination, curing of rubber, and, of course, the drying of textiles.

C. Norris Rabold, Chief Chemist, Union Bleachery, Greenville, S. C., received his A.B. from Dickinson College in 1925 and taught high school science and did graduate work in education at Pennsylvania State College during the next three years. He was a chemist in the Print Works Division of Pacific Mills in Lawrence, Mass., for the next five years, where he did research, control, and plant development work in printing, dyeing and finishing. He then joined the Research Service Department of Corn Products Refining Company where he did general service work both laboratory and field, on starch, gum and dextrine problems, cotton slashing, printing and finishing, for three years. He became chief chemist of Union Bleachery in Greenville, S. C., in 1936 where he is engaged in plant control, research and development work. Mr. Rabold is a member of the American Chemical Society.

There are two sources of radiant energy: first, electric lamps, designed to produce quantities of infra-red rays and second, burners, operating on fuel-oil or gas and provided with refractory surfaces from which infra-red rays are generated.

At present, a number of lamp installations are in operation in the industry. Lamps are being used for cloth and thread drying, elimination of moisture from Sanforizer blankets, drying of synthetic yarns in warp sizing, and carbonizing of wool. Some of the first units were rather crude affairs, consisting as they did of banks of lamps out in the open air. Of the total electrical energy put in a lamp, a portion is converted into light waves, of little value in drying, a sizable portion into heat, which in these open air units was nearly all wasted, and the balance into infra-red waves. Much of this energy was wasted, also, for no provision was made for the reflectance of rays that had passed through the material to be dried. Lamp engineers realized the low efficiency of the early banks of lamps and have made tremendous strides towards improvement. We now have lamp ovens, totally enclosed, and well insulated, the interior provided with highly polished reflecting surfaces, lamps mounted on the outside, where they can individually be examined or changed, and fans provided for recirculation and exhaustion of air. Thus, the highest possible use is made of both the radiant energy and sensible heat.

Advantages claimed for this method of drying are as follows:

1. Temperatures of 800°-900° F. possible.
2. High watts density input.
3. Uniform heat control.
4. Economy of initial equipment and maintenance.
5. Safety of operation.
6. Small floor space needed.
7. Heat action instantaneous, both on starting and stopping.
8. Cooler plant operating conditions.

Radiant-heat burners or infra-red burners, followed much the same course of development as did the lamps. It was first thought that all one had to do, was rig up some burners and pass cloth over them. True, cloth could be dried this way but very inefficiently, as again, much of both the infra-red and sensible heat was lost. Today, we have numerous installations of radiant direct-fired ovens, with others planned, that are carefully engineered to utilize all the released energy, from the fuel used. Such ovens are designed for water removal, resin curing, and solvent evaporation. Burners are located opposite each other with the yarn or cloth passing between; thus each burner acts as both a source of infra-red and also as a reflector; returning non-absorbed rays to the cloth. Here again, only a portion, not over 20 per cent, of the released energy is in the form of infra-red, the balance being light and sensible heat requiring a physical medium, such as air or other gases to carry it to the cloth by means of convection. Certain of these ovens contain instead of air, nitrogen, carbon dioxide and steam; thus minimizing the danger of oxidizing fibers and finishes. There is no oxygen present in the drier.

One progressive designer of this type of equipment states that mills possessing them have found the following advantages:

1. Great reduction in size of drying oven and space required.
2. Any desired drying speed, depending on size of installation.
3. Drying costs are reduced, from the moderate amounts to very substantial ones, depending upon available fuels.
4. Improved loft, especially noticeable on twills, pile fabrics, etc.
5. Considerable reduction in shrinkage.

6. The drying gas is oxygen-free and inert.
7. Greatly reduced first cost, compared to steam driers and necessary collateral equipment.
8. Negligible maintenance costs, only one moving part in oven.
9. A great reduction in priority material for oven construction.
10. Thermal efficiencies of 80 to 90 per cent compared to 20 to 50 per cent in conventional steam heated drying apparatus.
11. A completely independent unit.

The consensus of opinion among drying experts seems to be that indirect-fired and infra-red equipment will be used for some time to come to supplement and complement existing steam installations, as far as general drying goes. They can assist in lessening power plant loads, and at the same time, aid materially in speeding up production.

DIELECTRIC HEATING

This method of drying is rather a newcomer to the textile field. Only a few installations have been made, with most of them experimental.

Laboratory experimental work has been conducted in setting twist in small rayon yarns, including combination yarns and nylons. These have all resulted satisfactorily, and it is felt that electronics will prove to be of considerable advantage to mill owners in this application, since it makes it possible to set the twist in large packages, quickly and efficiently.

Several units have been supplied to textile companies for pilot installations, in which package drying of yarns, principally rayon, will be investigated. Here again, it is felt the possibility of drying large packages in a matter of minutes rather than hours, will prove to be of benefit to the industry. It has also been determined, in the case of rayon, that the electronically dried yarn has certain superior dyeing qualities over the conventionally dried yarns.

Laboratory tests have been made in curing resin impregnated and laminated cloths, in rolls. Results have all been satisfactory and again the time of curing is reduced to a matter of minutes versus hours.

Costs cannot be fairly compared with conventional methods at the present state of the art. Present costs are high, both in regard to equipment and operation. Cost of power varies considerably between localities, and has to be considered carefully. However, for certain applications, such as twist setting, it is believed that present costs will compare favorably with other methods. For such applications as drying, the saving will not be in drying costs, but in general improvements of handling, such as drying larger packages in less time, streamlining the operation and a general improvement in quality.

In concluding this paper, it should be remembered that it takes under the same conditions, the same number of B. T. U.'s to evaporate a pound of water or solvent, regardless of the source of energy, whether it be steam, oil, gas, or electricity. Any new drying or curing unit must be considered on an individual basis, with careful consideration given to all the factors involved. We cannot be too emphatic on this part, for we believe much of the misunderstanding and confusion that has existed, relative to drying, has come from an improper evaluation of what is needed under a given set of conditions.

The speaker wishes to acknowledge the valuable help and information received from the following companies. This is by no means, a complete list of manufacturers of drying equipment, so we do not mean to imply that satisfactory and efficient installations cannot be made by many others.

Andrews and Goodrich
B. F. Sturtevant Company
C. M. Hall Lamp Company
Fostoria Pressed Steel Corporation
General Electric Company
Industrial Heat Engineering Company
Proctor & Schwartz
Radio Corporation of America
Trumbull Electric Mfg. Company
Westinghouse Electric & Mfg. Company

DISCUSSION

CHAIRMAN NEWMAN: Thank you Mr. Rabold, for your excellent paper.

I believe I am correct in making the statement that this problem of drying has been a very much neglected subject in the textile mills for quite a number of years. As a result, most of the developments have been very recent. Due to the cooperation of a number of concerns who have carried out a large amount of development work on this subject in recent years, they have been very cooperative in arranging for some of the members of their engineering and technical staffs to attend this meeting. Since it is the first time that any of these gentlemen, to my knowledge, have attended a meeting of the AATCC, I consider it a privilege and an honor to have them here.

. . . The following took part in the discussion:

James D. Hall, Commercial Engineering Department, Westinghouse Electric & Manufacturing Co.; C. A. French, Industrial Heat Engineering Co.; Paul Krupp, Fostoria Pressed Steel Corp.; [illegible] Russell Jeffry, Fostoria Pressed Steel Corp.; C. N. Batsel, Radio Corporation of America; Mr. Chapin, Radio Corporation of America; Lucien Buck, Proctor & Schwartz Co.; J. F. Gschwind, J. O. Ross Engineering Corp. . . .

D. R. SMITH: I would like to ask these gentlemen who are interested in dielectric heating if it is practical for package work, or how much work has been done?

MR. BATSEL: We have dried these packages in a matter of 20 minutes, and there is less migration of the dye. Apparently migration is brought about by excessive drying from the outside and the slow penetration of the heat into the package. In electronic drying, the package is heated rapidly all the way through with the result that there is a reduced migration and you get a better final color when the yarn is dyed.

MR. SMITH: Does it pass on an endless belt?

MR. BATSEL: Yes.

MR. SMITH: The yarn passes along between the electrodes?

MR. BATSEL: That is right. There are a number of ways to build a drier, but generally the belt idea seems to fit in because it is continuous.

MR. SMITH: Is it necessary for you to extract the yarn first? Can you take wet yarn?

MR. BATSEL: No. It should be centrifuged, because, as Mr. Rabold pointed out, electric energy is expensive and there is no use using it to remove water that can be slung out.

JAMES J. GRANT: How much if any experimentation has been carried out with radiant drying for agers, and how successful has it been?

MR. RABOLD: Printing agers?

MR. GRANT: Yes.

C. A. FRENCH: We have done a little bit of work in drying camouflage cloth printed both sides, pulling the backgrey away before passing it through a radiant fired oven.

I don't imagine that quite answers your question, but it is close to it.

MR. BALASSA: I wonder if any of the equipment manufacturers' representatives could tell us where the break in cost is between steam, electricity, when infra-red drying, and the gas, also for infra-red drying, disregarding the cost of the installation?

CHAIRMAN NEWMAN: That is in drying piece goods?

MR. BALASSA: Yes.

LUCIEN BUCK: All I can tell him is this: I can't give you the exact figures, but our experiments show that when using

gas with infra-red, it runs about three to four times the cost of steam per pound of water evaporated. And in electronics it will probably run 10 or 15 times as much. That is in money. In other words, if you are using steam to evaporate a certain quantity of water for $1, it will cost you $5 for gas and $10 or $15 for high frequencies.

MR. FRENCH: I would like to take issue with those figures. The drying cost for infra-red, that is, gas burners, depends on whether or not you make use of the sensible heat that is also given off at the same time the radiant heat is. If you use only the sensible heat you might as well use electric lamps, you are going to come out just about the same place, as the radiant energy is only about 20 per cent of the total.

MR. BATSEL: I am not quite sure that electronic heat can be applied to piece goods. Neither am I so sure the statement that electronic drying will cost 15 times as much as conventional methods is anything like correct. It remains to be seen. I have a suspicion, that if your power costs are reasonable, you can dry package goods centrifuged down to say 40 per cent water by dry weight, that the cost will not be too far out of line with the conventional methods. I am basing that on some figures that were obtained from some people that manufacture steam driers. Neglecting equipment and installation cost and considering only the operational cost, electronic drying becomes more useful as the packages are increased in size.

Some factors of importance when considering electronic drying are speed and the fact that all your energy goes into the work and is not radiated into the room and surrounding atmosphere. Even though it does cost more per B.T.U., these factors and others contribute to making the overall cost of package drying using electronic heat reasonable in comparison to conventional methods.

EDWARD A. FRIEDBERG: In drying on drying frames in combination with infra-ray lamps, where the space is limited, I was wondering if the danger of spontaneous combustion occurs, and if a recommendation is made for cooling?

MR. JEFFRY: We have never heard of anything like that taking place.

One thing I want to touch on is the cost of operating comparing steam with radiant energy. I don't believe that there are very many textile people who know the cost of generating their steam or getting it in through the drier on the material. It is a rather broad subject to make a comparison in generalities and say that it is so many times as much. Every textile plant operates on a different rate schedule, and the methods of generating the steam are all different. You have to figure transportation, get in some of these plants and see the tremendous losses of steam, and so forth, which have to be taken into consideration in making a fair comparison. And there are so many other factors that enter into it that I think the cost of the kilowatt hour compared to the cost of steam is not quite a fair comparison.

MR. SCOTT: What is the effect of infra-red on the shade as compared to air convection methods of drying?

MR. FRENCH: I have never observed any difference.

CHAIRMAN NEWMAN: It has no effect on the shade?

MR. FRENCH: No effect whatever. Infra-red seems to be inert to all organic substances.

ARTHUR VEEVERS: It would seem to me that there would be a difference there. Steam is not inert; you get many a change, which sometimes is a fixed change, with certain direct colors and developed colors, and it would seem to me we are going to get a difference in that connection.

MR. FRENCH: That might be true if it were saturated steam, but it is superheated steam.

MR. VEEVERS: No, I mean between steam and the electrical drying.

MR. FRENCH: We have never observed any difference. I have put out lamps and I have put out gas heated burners, and I have never put them out just setting them up against a stack of cans or anything of that kind, I have built them into a drier. And there has never been any effect that could be detected on color of any kind. We haven't used it or tried it on all colors yet, but as far as we have gone there has been no effect.

R. H. SOUTHER: The question I would like to ask would be about the warp size and drying. I wonder if any work has been done on that phase of the textile process and what the results are?

CHAIRMAN NEWMAN: Can anyone answer whether any work has been done?

MR. FRENCH: We have built a warp drier, where the warp is dried with direct heat. It is not installed yet, but we have done a large amount of experimental work, and we are well satisfied that we have the problem pretty well licked.

MR. MUELLER: With respect to that 40 per cent moisture, there is no such thing. The lowest we know of is 60 per cent.

MR. BATSEL: I cannot get into a discussion of that. The packages that we have worked with—and we have had them from two different people—weighed 24 ounces dry and 36 ounces wet, or in that neighborhood. This is about 40 or 50 per cent water based on dry weight.

MR. GSCHWIND: Would the gentlemen of the high frequency apparatus care to say what size of unit they had to use to dry this kind of a package?

MR. BATSEL: It would all depend on your production rate. As I said a while back, one kilowatt of power will generate 3413 B.T.U. per hour. It depends on how many you want to dry an hour and how much water the packages contain.

MR. GSCHWIND: That is true, but since the amount of water has been stated and also the time of drying, how many kilowatts did you use per package?

MR. BATSEL: Do you want to take it out in 30 minutes or 20 minutes?

MR. GSCHWIND: Let's say 20 minutes as you stated yourself.

MR. BATSEL: If you want to take out a pound of water in 20 minutes—based on the possibility of evaporating 2½ pounds of water per hour per kilowatt—it will require a little over one kilowatt to remove one pound in 20 minutes.

MR. GSCHWIND: Two and a half pounds of water?

MR. BATSEL: Per hour per kilowatt. The input to the generator will usually run about twice what you get out of it and consequently put into the work.

MR. GSCHWIND: There was also another question brought up about radiant heat and the possibility of explosions and fire hazards. It seems to me that this can be overcome, and I know it has been overcome in the somewhat different field of synthetic coating of metals, by totally enclosing the ovens and by providing suitable ventilation. If an oven is built the same as a convection oven, with insulation to prevent heat losses, it is possible to provide for such an atmosphere so that explosions or fires will not occur, by keeping the solvent concentration below flammable and explosive limits. I think that is one of the features of Infra-Red ovens which was originally overlooked. Experiments have proven, and it has been demonstrated mathematically, that Infra-Red ovens must be enclosed to obtain maximum efficiency.

RAPHAEL E. RUPP: I think it is a fairly well established fact that the speed of drying is very decidedly affected by the thickness of the cloth. In other words, if you had two fabrics of the same weight, one twice as thick as the other, it would take, roughly, four times as long, or you would have to run the

thick one at only one-fourth of the speed of the thin one. That may not be exactly right, but approximately. Is that same thing true, do you know, in electronic drying and infra-red drying and hot air drying? Does this thickness for the given weight of cloth affect the rate of drying in the same adverse way?

MR. FRENCH: Yes, sir, it does. It has been our experience.

MR. RUPP: Just the same?

MR. FRENCH: Yes, sir.

JOHN BUCHERT: Speaking about the color changes between the various systems of drying, I wonder whether there is a permanent color change or only a temporary color change due to the method of drying.

MR. VEEVERS: I think we all agree that the change is more or less permanent. The change might be very, very noticeable at the immediate end of drying while the yarn is still hot; of course it cools down and comes back to a marked degree, but many dyes don't come back entirely. I think that it generally known. They don't come back all the way, you might say.

MR. BUCHERT: You feel that these newer systems of drying will still have that effect?

MR. VEEVERS: I gather that we won't get that change. As a matter of fact, it would seem to me that would be an advantage.

MR. BUCHERT: Well, it would be, a tremendous advantage.

MR. VEEVERS: We sort of allow around the corner for that heat change at the present time. That is one factor of variation we wouldn't have to contend with.

W. B. CARROLL, JR.: I would like to know if anything has been done in drying dye beams, and do the heads and metal in the heads of the dye beams interfere in any way with electronic drying or do they get too hot and scorch the yarn at the head?

MR. BATSEL: We have never dried anything on beams. We have dried yarns on metal-ended bobbins and wooden-ended bobbins, and we got by all right. I suppose drying on a beam would be practically the same thing.

EDWIN W. ADAMS: On this infra-red drying, I am interested to know if there is any comparison of cost, say getting your infra-red from gas, perhaps made from fuel oil or kerosene, in comparison with costs of coal, soft coal?

MR. FRENCH: I would say that as a rule your coal cost is about two cents a therm, a therm being 100,000 b.t.u. The No. 1 furnace oil, in this company's territory, is about five cents a therm. There are places down South where they are getting natural gas for less than two cents a therm.

In comparing the operating cost, if you want to compare it with cans, for instance, you have your boiler efficiency, which may be 80 per cent, your line efficiency, which may be 95 per cent, your can efficiency, which is about 50 per cent, if it is a good can. Together, you will get about 37 per cent over-all efficiency. You can easily build a drier with 85 per cent efficiency. I think that answers the question.

MR. SMITH: Do you use a stainless tube or a bakelite tube?

MR. BATSEL: It doesn't make much difference what you wind it on.

MR. SMITH: The steel would be all right? It wouldn't get too hot?

MR. BATSEL: No, the steel won't get hot.

MR. MOBLEY: Do these new forms of energy, like infra-red, electric heat, evaporate the water directly in that form, or is it necessary to convert it into sensible heat before it does evaporate?

MR. HALL: I think it is perfectly obvious that—I am thinking of radiant energy now—the energy is directed on the object which is to be heated and is converted into central heat.

MR. OSBORNE: I would like to ask if there has been any experience on the drying of rayon cakes with dielectric energy?

MR. BATSEL: Drying rayon cakes is one of the first things we tried and is one of the places where pilot plant operations are going on. Rayon cake drying is one of the places where improvement in quality has shown up and where the time cycle has been cut down from 100 hours or so to approximately 30 minutes. It is a place where we think electronic drying will prove itself.

It is our thought based on experience in drying rayon cakes, that it would be well for anyone who has a package drying problem to investigate electronic drying. We are not sure at present that electronic drying will be able to compete with certain other methods in drying cloth in sheet form or in semi layers.

MR. OSBORNE: Is it most efficient for the largest cake?

MR. BATSEL: Yes. Where you have a large cake it takes considerable time for the heat to penetrate to its interior. With the electronic principle of drying, the heat is generated at the innermost portion of the cake just as quickly and rapidly as it is on the outside with the result that complete uniform drying is accomplished.

. . . The session on drying re-convened at 4:50 o'clock, Chairman Newman presiding . . .

CHAIRMAN NEWMAN: Mr. Krupp of the Fostoria Pressed Steel Corporation announced the fact that he had a number of slides that he would like to show. Before we proceed with the showing of the slides, I would like to know if any of you have any questions that you would like to ask the gentlemen in connection with the dielectric type of drying.

JOHN BUCHERT: I would like to ask the gentlemen what effect the newer types of drying have on pieces that would be stopped in the drier in comparison with the conventional older type of drying machines in vogue today.

CHAIRMAN NEWMAN: In other words, what would happen to the goods?

JOHN BUCHERT: What would happen to the goods.

MR. BATSEL: This type of heat stops instantaneously and it starts the same way. So if the machine stops, the heat would stop and when the equipment starts, the heat would start immediately. The intensity will depend upon the power input.

JOHN BUCHERT: There would be no tendering effect noticeable of the yarn at the source of heat that you have there?

MR. BATSEL: No, there is no ray. The heat is generated by the high frequency currents and when the current stops, the heat stops, and when the current starts, the heat starts. It is instantaneous, and it starts at its full intensity. If you have a lot of radiation, you will have some resultant loss of heat, and it naturally takes a little time to raise a large volume of material up to a high temperature. Usually this is only a matter of seconds and is proportional to the power that you put into it.

MR. BUCHERT: In other words, what effect would it have if the goods were like a heavy 20-ounce suiting, or 22-ounce overcoating?

MR. BATSEL: You would put more power into it.

MR. BUCHERT: Would there be any danger of burning in case you had that high power?

MR. BATSEL: No, you would adjust to prevent that.

MR. BALASSA: If you heat up a big roll of goods, you say that the heat will stop instantaneously; your heating may stop instantaneously, but you have generated heat there, and you have an excellent insulator. That roll will remain hot for a long time, won't it? You can't just reverse the current and cool it. How then, would you propose to unroll the thing—

MR. BATSEL: It will not get any hotter. He spoke of burning.

MR. BALASSA: Well, I am speaking from a different angle.

MR. BATSEL: It will stay the same temperature and gradually cool off.

MR. BALASSA: Maybe a day or so, maybe two days.

MR. BATSEL: It would depend on the size of the package.

MR. BALASSA: That is just it.

MR. BUCHERT: I was primarily talking about goods in the open width. You were drying in the open width, and you would only have your contact point at your—

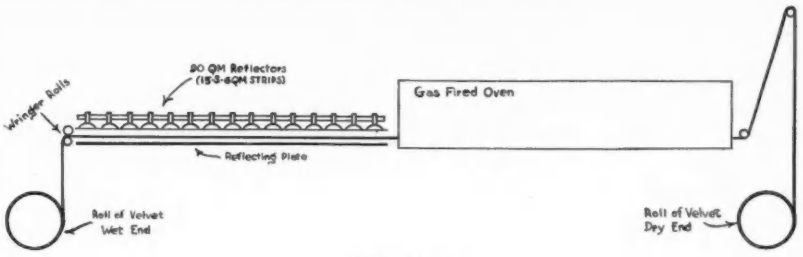
MR. BATSEL: The heat would stop immediately and start immediately, and if the body is thin and cannot store up a lot of heat it will cool off very quickly.

MR. BALASSA: I would like to repeat my question, as to what to do with that stored heat in the goods. If you have a large roll, and you dry it, you are going to generate a lot of steam, in the first place. How is that going to leave that roll, and after it leaves it, you are left with a hot roll. How do you propose to cool it?

MR. CHAPIN: Maybe this will help just a little bit. In the case of large rolls or cakes of rayon or cotton, it is true that if you once heat the large roll, naturally you have to allow for the heat being retained in it. The roll of material, naturally, is as good an insulator for the heat escaping as it is for the heat penetrating into it when applied by conventional methods. There is one thing that enters into the drying of rolls or cakes by this type of heating—electrostatic, electronic heat—and that is if you have a roll or several rolls or cakes, in spool form, passing between your electrodes, they go in wet and travel for several feet on the belt before they become partially dried. The wet cakes will take most of the power. As the cakes approach the dry end of the dryer, they will take less and less of the power as they go through. So, if there is a variation between the moisture content, the fact that the ones that have the highest content of moisture will take the most power will help in averaging out the amount of power that will go into each roll or cake.

In case the conveyor stops, which is what you are concerned with, due allowance will have to be made from the time it stops until the time it is started again in order to make up for the amount of heat that is lost during the shut-down. However, the averaging effect mentioned might help in keeping away from too critical a time value.

CHAIRMAN NEWMAN: I will now call on Mr. Krupp.



Slide No. 1

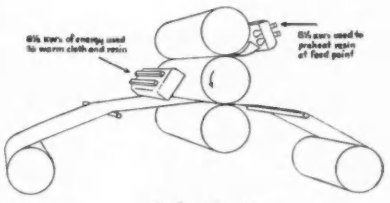
PAUL KRUPP: Carrying over from our morning session, I want to emphatically point out that we came down here with one interest only, and that was to try to show something, or say something which might be of benefit to the textile people atending the sessions. We certainly hope not to incur the wrath of any other equipment manufacturers who might consider themselves competitive to us, because that certainly is not our purpose here whatsoever.

We do not believe that infrared is a cure-all for all applications of heating in industry, and certainly not in the textile industry. There are so many applications in the textile industry where we believe infrared can be used advantageously for a variety of drying and curing and setting operations that it would be rather silly to think that we should or could have a monopoly on all of them and that our process of infrared would be the only method which might be adopted.

(Slide No. 1.) This is a draftsman's sketch of an infrared job. The installation was made at the front end of a conventional drier, and this represents the conventional drying portion. Here we have a group of infrared reflectors mounted over the travel of the cloth prior to its entering the conventional oven. It is positioned about eight inches from the travel of the woolen cloth. In other words, the face of the reflector is approximately eight inches from the travel of the cloth itself.

The material is said to have a moisture content of 30 per cent after coming from the extractor. The infrared unit is said to raise the temperature of the cloth to approximately 190 degrees F. by the time it enters the conventional drier. Much more uniform drying is claimed with the addition of infrared as an auxiliary drier, and production was increased from four to six cuts per hour. Using 375 watt lamps in the reflectors, a total connected load of 20 kw resulted from this installation.

(Slide No. 2.) A number of mills have modernized their old calendering machines by the addition of infrared units,



Slide No. 2

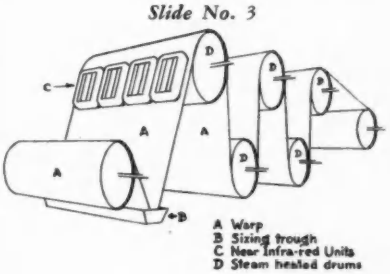
and this is what I meant when I said a moment ago that there are so many applications for infrared that it seems unfortunate that we should be talking only to the cotton section of this convention, inasmuch as there are applications on calendering, and in the woolen section, in plastics, and so forth.

This is a sketch showing how one infrared unit was installed to preheat vinylite resins prior to being calendered to cloth.

This represents a special type of infrared unit, and here is another of the same type up here. Here the unit is preheating the cloth prior to it going through the calender. In other words, it brought the temperature of the cloth up so that a better adhesion was gained when the material was calendered to it. In this case, the infrared was used to preheat the vinylite resin prior to it going on the calendering rolls.

(Slide No. 3.) A mill at Lanacster, Pennsylvania, engaged in the weaving of rayon cloth, had a Government contract for a special cloth. Attempting to size the cloth on a conventional slasher, they were unable to obtain the desired speed. They installed infrared units in the manner shown in this slide and found

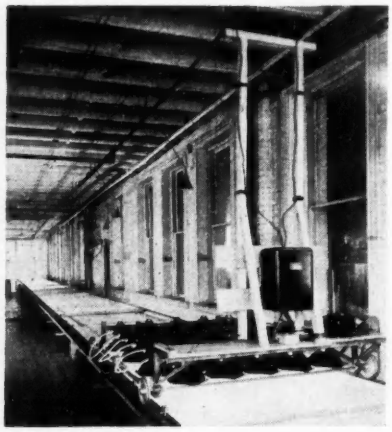
Slide No. 3



them a definite advantage. The infrared units were mounted to heat the warp yarn after sizing, but before the yarn came in contact with the water-heated rolls.

This, of course, represents the roll of cloth going down into the sizing trough, and then starting its travel over the water-heated cans. Here are the infrared units mounted after the cloth has come from the sizing trough, and just prior to their starting over the first unit of hot water-heated cans.

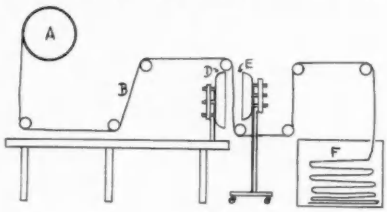
(Slide No. 4.) Here is a photo of an unusual installation used for drying ink on Koroseal luncheon cloths.



Slide No. 4

The infrared unit is suspended three inches from the table top and moves the full length of the 90-foot table on a track. The cloths are placed side by side on the table. Twenty minutes' time is required to travel the full length of the table. One minute and twenty seconds is required to dry the 54 by 54 inch cloth.

Here are the infrared reflectors built on a special framework. The framework is then mounted on a track with wheels which travels the full length of this 90-foot table. Possibly you can see the breaks between the various 54 by 54 inch cloths as they are spread out on the table.

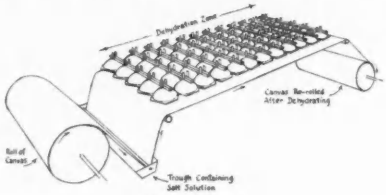


A Roll of cloth
B Travel of cloth
D Evenray
E Evenray
F Box – Dry cloth folds
Speed – 8 yds. per min.

Slide No. 5

(Slide No. 5.) The sketch shown in this slide is of an installation designed to dehydrate black trico cloth 55 inches wide, using 375 watt and 500 watt lamps in the two infrared units indicated here and here, facing each other, with the cloth running down between them.

They are able to remove 66 pounds of water per hour, and the cloth travels at a speed of eight yards per minute.



Slide No. 6

(Slide No. 6.) The Industrial Gloves Company of Danville, Illinois, installed infrared equipment over a flat conveyor which carried duck material to dehydrate approximately 12 per cent moisture. Eighty yards of this 36-inch wide ducking are dehydrated per hour. Sixty reflectors using 375 watt lamps are used on this job, and here you see the infrared reflectors built into a special framework mounted over a flat conveyor with the duck material unrolling here, going through the sizing trough, and over down through the other end where it is again rolled.

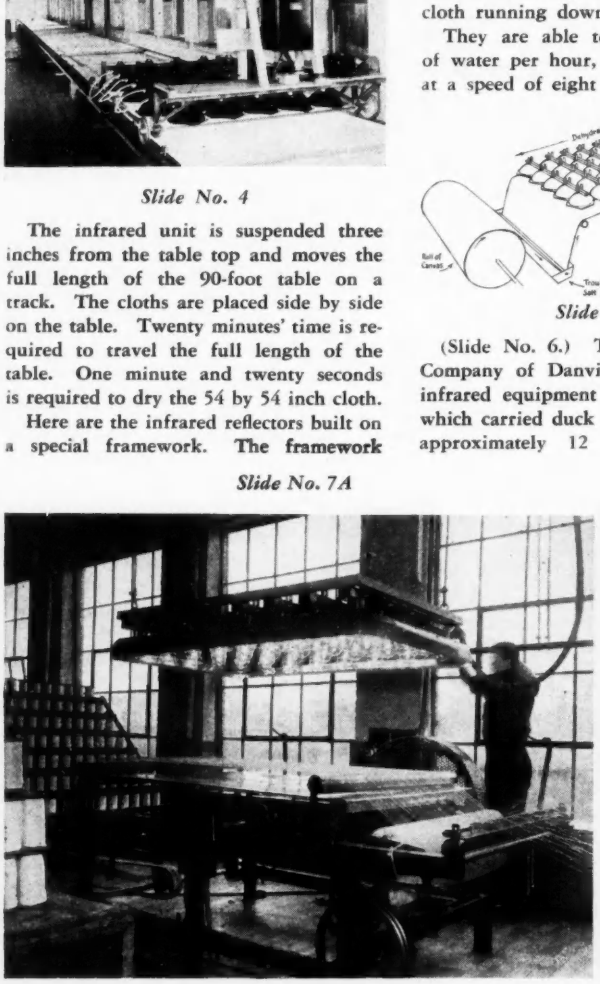
(Slide No. 7A.) Here we have an unusual installation for drying thread. I want to explain that through no fault of the infrared equipment it is not in use at the present time. Infrared did all that was expected while it was in operation, but due to the inability to secure new parts for this special threading machine, it was necessary to discontinue its use. When in operation, the infrared unit, mounted over the travel of thread, dried 100 pounds per hour as compared to 100 pounds in four hours in a conventionally heated oven. The infrared removed approximately 7 per cent moisture from the thread at a speed of 80 feet per minute.

The thread was wound from one set of spools through the infrared zone and onto another set of spools at the opposite end.

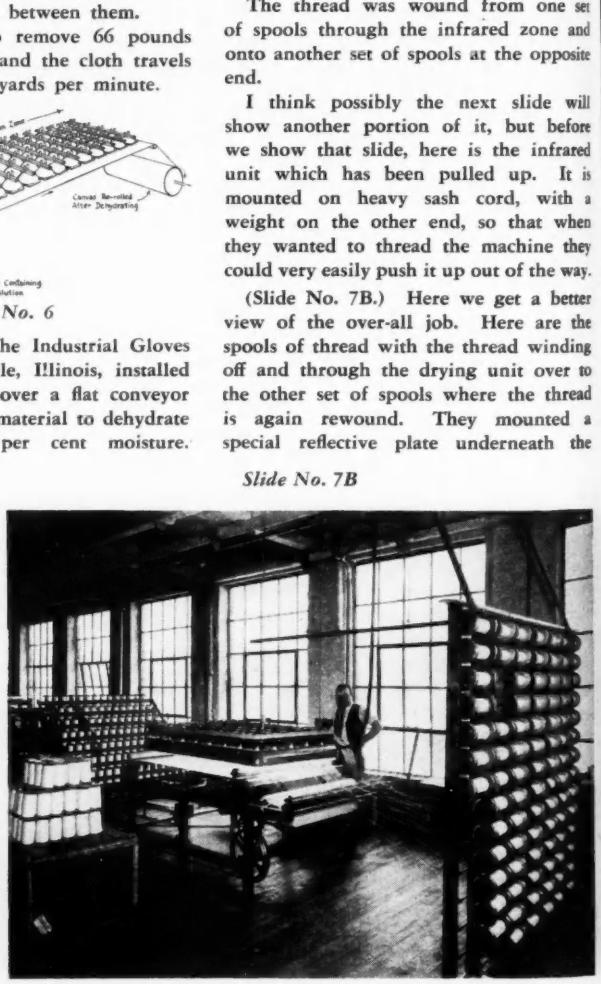
I think possibly the next slide will show another portion of it, but before we show that slide, here is the infrared unit which has been pulled up. It is mounted on heavy sash cord, with a weight on the other end, so that when they wanted to thread the machine they could very easily push it up out of the way.

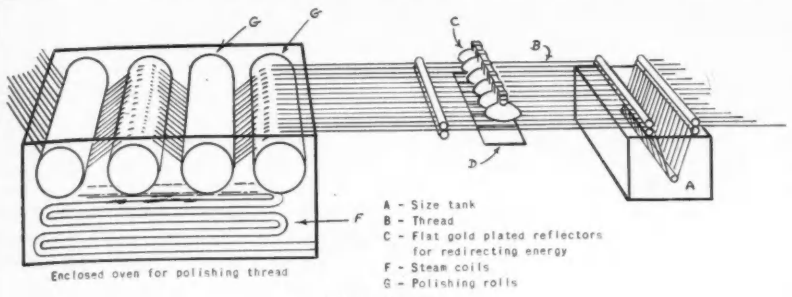
(Slide No. 7B.) Here we get a better view of the over-all job. Here are the spools of thread with the thread winding off and through the drying unit over to the other set of spools where the thread is again rewound. They mounted a special reflective plate underneath the

Slide No. 7A



Slide No. 7B




A - Size tank
B - Thread
C - Flat gold plated reflectors for redirecting energy
F - Steam coils
G - Polishing rolls
Enclosed oven for polishing thread

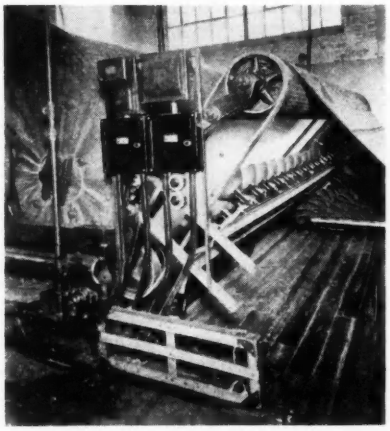
Slide No. 8

unit and just below the travel of thread which utilized the infrared energy by reflecting the rays back and forth.

(Slide No. 8.) This slide shows an installation to dry thread after coming from a sizing bath and prior to polishing operation. As the thread comes from the bath, 375 watt infrared lamps and reflectors are used to dry the thread. Flat, gold-plated reflectors without lamps are placed opposite the lamp units to direct the energy back and forth onto the thread. The thread later enters the part of the machine where polishing occurs.

Here is the thread coming down through the bath. Here are the infrared units. Here is the gold-plated sheet underneath the units which redirects the energy back and forth. The thread continues over into what would normally be considered the entire drying operation; where it passes over the polishing rolls, the entire enclosure here was heated with steam coils. The entire premise of the installation was on the basis that—similar to polishing your shoes when they are damp, they certainly do not attain the high polish which is possible when they are dry—thread, when heated and thoroughly dried, would give a better polish.

(Slide No. 9.) As early as 1940 the



Slide No. 9

Downs Carpet Company in Philadelphia were using infrared to assist in the drying of the Wilton rugs and carpets after they had been given a final steaming. Infrared, as supplemental heat, made possible the speedup of 25 to 35 per cent, according to the variety and weight of carpets. The installation was accredited with saving much overtime of workers. It was very simple. It was just a matter of installing two rows of reflectors at this position on the drying machine to give the conventional drier an extra boost of energy.

(Slide No. 10A.) This is a slide of the Arms Textile Manufacturing Company installation at Manchester, New Hampshire, and also represents an installation which is in operation at Continental Mills, Philadelphia. The photo will pass for either installation.

In both cases, woolen cloth is dried. Arms Textile reports a definite speedup of drying with infrared. Continental Mills vouches for a 40 per cent increase on 32-ounce woolen overcoat material.

It is difficult to discern the infrared unit. It is a special unit mounted in this position. Here you see the cloth coming up here on the regular tentering frame and starting into the conventional drier. Infrared served only as supplemental heat in this case but established a definite speedup.

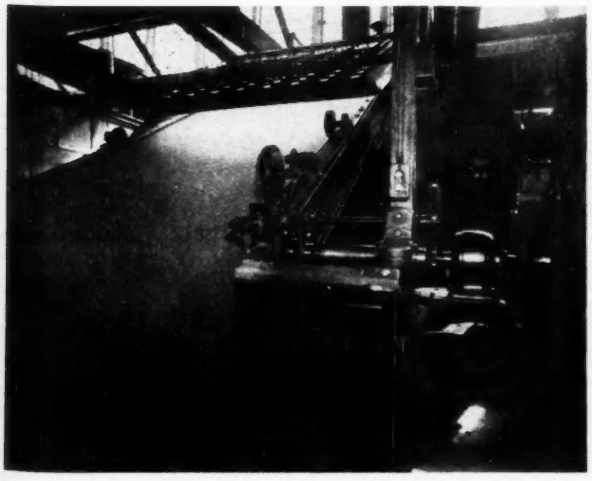
(Slide No. 10B.) This is another view of the previous photograph. It gives you a side view of the unit. It gives you a better view of the tentering machine itself, and the cloth coming out here after it is dried.

(Slide No. 11.) This is a photo of an installation which has been duplicated in several mills. This particular photo was taken at Avondale Mills, Pell City, Alabama. It is used to dehydrate the woolen blanket on a sanforizing machine. The addition of the infrared unit afforded a production increase of approximately 33 1/3 per cent.

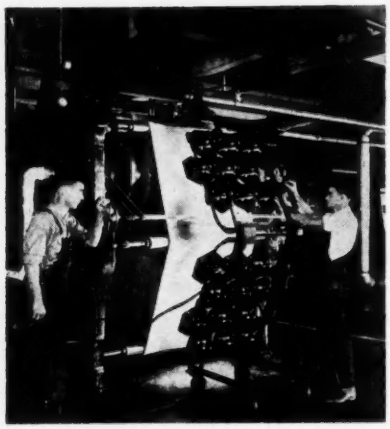
Here again we see the infrared reflectors built on a special framework. It is portable, on casters, so that it can be moved to any position that is necessary. It does nothing more than heat this sanforizing blanket which, of course, aids in the sanforizing operation.

I would like to have just about five

Slide No. 10A



Slide No. 10B



Slide No. 11

more minutes of your attention, if I may. I realize it is getting late. Mr. Rabold this morning pointed out some very interesting things in regard to drying, and I will try not to repeat several things which he said. However, I would like to have about five minutes more to top off this group of slides on infrared.

Forgetting for a moment the progress already made in the application of infrared to textile operations, let's take a look at future possibilities in the light of new equipment developments and when drying operations are approached in a scientific manner, recognizing that many textile methods and the machinery used have not changed for a good many years in some instances.

In the conventional steam can drier in use today, there are actually three stages in the drying process; that is, if we understand it thoroughly from our study of it. The first stage occurs where the moisture-laden cloth comes in contact with the steam cans. As the material reaches and passes over the first few cans, its surface moisture will be removed rather rapidly. Perhaps 50 per cent of the drying takes place in this first stage when the temperature reaches approximately 212 degrees F. In this first section, the latest developments point to the use of air currents to speed up drying. The idea is exceptionally sound, when one stops to realize that it is next to impossible to pull moisture out of cloth into a saturated surrounding atmosphere. By stepping up induced air currents from 100 to 200 or even 300 feet per minute, it may be possible to speed up drying as much as 50 to 60 per cent when heat is also properly applied.

After the cloth reaches 212 degrees F. it can be considered to be passing into the second stage of drying where moisture must be removed from the interior of the cloth by capillary action. During the second stage, the rate of moisture removal recedes and consequently the volume of air should also be reduced. In this second stage, the temperature of the cloth may vary from 212 degrees F. on the interior to 275 degrees F. on the surface.

So far as free water is concerned, the cloth might be considered absolutely dry in the second stage. As the cloth continues over a few more steam cans into the last drying stage, the heat effects a change in the remaining chemical moisture, modifying the product form in some way.

I have in mind there, carbonizing operations where it is necessary with heat to transform the various materials remaining in the cloth, so that they can be beat or shook out.

You probably wonder why we introduced the discussion and what infrared has to do with it. It is understood that new infrared equipment developments will make it possible to reach a watt density input into the work of 12 watts per square inch. Whether it will be possible to eliminate the present type of drier in view of new infrared equipment is not known at present. However, infrared equipment installed in conjunction with the steam can drier will make it possible in many cases to eliminate many sections of cans and speed up drying almost unbelievably.

Where will the new type of equipment be installed? Well, there are different schools of thought on that subject. Some say ahead of drying stage No. 1. Others believe it should be used in conjunction with conventional driers during drying stage No. 2. It is likely that what was previously drying stage No. 3, or the last stage in the drying operations, may be eliminated as far as steam can equipment is concerned. At any rate, elimination of any given number of steam can sections will release much floor space and save the initial investment of costly equipment.

Infrared will offer these advantages: High watt density input, uniform heat control, economy on initial equipment and maintenance, safety of operation.

In the event that many sections of conventional steam cans are eliminated, it may be possible to install this supplanting infrared equipment on the ceiling, thus saving floor space. The action of infrared is instantaneous, no heating-up time is necessary. Heating starts as soon as the lamps are turned on. Thus, there is no standby loss of energy prior to starting either at morning or between shifts.

In the event that infrared replaces a large block of steam cans, which seems possible, it means that certain boilers may be eliminated, likewise stokers and crews to operate and maintain them. Infrared will eliminate the discomfort of excess heat from steam pipes in the surrounding areas during the summer.

MR. FRENCH: I would like to ask if you have gone into the temperature of your source of production of infrared and what effect changes in temperature have on the production of the penetrating portion of the infrared. That is, I suppose you have a filament of low temperature. Have you measured the output of infrared in that, compared to a high filament of the penetrating band?

MR. KRUPP: Of course, the only source which we can use in our equipment, or which any other equipment manufacturer can use in his equipment, is that source which is supplied by the lamp manufacturer. We are, of course, governed to that extent. Mr. Jeffry, could you touch a little more on that?

MR. JEFFRY: There seems to be some difference of opinion on the part of different people as to the relative merits of different types of filaments in lamps with regard to penetration. Personally, I haven't been able to discern any difference in them. I think I prefer the one with the low color temperature. Whether it does a better job than the one with the high color temperature, I am not in a position to say. I don't think there is very much difference.

MR. FRENCH: Well, I base my question on the fact that suppose you set up a piece of glass on a cold winter day. You can distinctly feel the warmth on the far side of the glass if you let the sun shine on it, but it apparently doesn't warm up the glass. You have set it up against an extremely high temperature source, and practically all the radiation passes through it, and the glass is very little affected by it. However, if you drop the temperature to a thousand degrees or less the glass instantly warms up, showing that it is absorbed when it comes from a low source.

We have recently used some Infrared burners with greatly extended refractory surfaces producing more low temperature radiation. By this means we can considerably shorten the oven and put more effective radiation in the cloth.

MR. JEFFRY: You are speaking of gas infrared?

MR. FRENCH: I use lamps on any amount of water from 125 pounds an hour on down. I think that is where they distinctly belong. When I go above that, I prefer to use the burners, because of the operating expense.

MR. JEFFRY: Well, in that connection, I would substantiate a hundred per cent what Paul Krupp said, that incandescent infrared is not the answer to every prob-

lem, any more than your gas infrared would be, or the theory of electronics.

MR. FRENCH: There is nothing magic about infrared.

MR. JEFFRY: That is right.

MR. FRENCH: It is just the application of something we have known all along, that is all.

ALBERT GRIMSHAW: I would like to know if there has been any work done, or any installations made, or any study made, of infrared drying for the cotton slashing machines of the five and seven can. You had the multiple can shown there for rayon and silk, but have you done anything on the five- and seven-foot cans of the cotton slasher?

MR. KRUPP: I understand our representatives in Atlanta, Georgia, are attempting to study those particular applications in the very near future. I talked with one representative of Southern Industries, Inc., who represent us throughout the South, and they have some ideas as to the approach to those problems. I think that in the very near future they expect to conduct some experiments in plants in the South on those operations.

MR. GRIMSHAW: They haven't gotten along far enough to know whether they will use both cans, or drop one can and leave the other one ?

MR. KRUPP: No, they have not.

MR. FRENCH: I would like to say that we have experimented with a slasher drier for about four years. We have gone away from the cans entirely. We use a very large infrared burner where the warps come in. The warps are separated into three layers, you might say, so that no warp touches any other warp. Then this large infrared burner, 34 inches long, is set underneath the warp, and the heat from it is circulated back and forth through the warps 12 times, and then the steam is recirculated and reheated.

R. HOBERT SOUTHER: In regard to that last question, what was the type of heat? I didn't quite understand.

MR. FRENCH: Infrared gas burners. That is, we burn oil in them. It is a typical gas flame type, you can't tell whether you are burning gas or oil.

MR. SOUTHER: Plus the infrared?

MR. FRENCH: That is right.

MR. BUCHERT: I would like to ask the same question I asked before. What happens when the machine stops?

MR. FRENCH: There is a heat-resisting slide, which is pneumatically operated and it goes in to mask the residual heat of the burner from the warps. The top of the machine opens up, and it has access to cold air, room air. That is recirculated through until you again put the machine in operation.

MR. BUCHERT: You see, what I am worried about is when it stops.

MR. FRENCH: We do the same thing on driers, because there is too much residual heat in the burners.

DISCUSSION ON PIGMENTS*

CHAIRMAN NEWMAN: Gentlemen, at this time we were to have a paper on "Pigments—Their Use in The Textile Industry" by Mr. Henschel. Unfortunately, due to conditions beyond his control, Mr. Henschel was unable to attend the meeting to present the paper. However, it is a subject of such interest to the cotton textile industry and other industries of a similar nature that we felt we should continue or try in some manner to carry on a discussion on the subject.

The General Program Committee suggested that we have a round table discussion as a substitute for the paper that was originally scheduled. I understand that here again we have a considerable amount of talent from those companies who have done a lot of development work on the application of pigments, both in printing and in dyeing.

I am going to take this opportunity to call upon several of the representatives of those companies to see if they would care to tell us about some of their more recent developments. I am going to call first upon Mr. McLean, of the Aridye Corp.

PRINTING AND DYEING WITH PIGMENT COLORS

ARTHUR McLEAN: In introducing the subject of printing and dyeing with pigment colors, I should like to discuss very informally some of the factors involved in their application.

As most of you know, there are four systems of applying pigments to textiles: First is the water-in-oil type of emulsion, which was originally introduced for printing, and later adapted to dyeing. Second is the oil-in-water emulsion. In its application to government netting this type has proven very successful. The third system, the all-solvent method, has its greatest value in the production of flameproof and mildewproof fabrics. The last of these systems, the all-aqueous method, involves the use of several types of binders, depending upon the requirements to be met. In the case of cotton marquisette netting, where shrinkage control, stiffness of hand, and excellent fastness to weathering are required, Ceglin acts as an excellent vehicle for the water-dispersible pigments. Or where low costs, ease of plant application, and fastness to light are factors, the modified starch vehicles which exhibit binding properties have proven satisfactory.

Regardless of the medium used in the application of pigments, it can be said that their merits are: Superlative fastness to sunlight—a complete range of colors can be selected that will withstand more than 300 hours in the Fadeometer. Their inert nature has eliminated exhaustion difficulties in padding liquors and has enabled processors to turn out lots on shade from end to end. Seconds have been cut down materially, and time has been saved in many instances. As pigments exhibit their true shade directly after printing or dyeing, thus defects can be readily seen at the print machine and immediately corrected, or shades can be more accurately matched, as development after application is not necessary.

In considering the four systems of applying pigments certain advantages are characteristic of each. In printing with water-in-oil emulsions it has been found that the fidelity in reproduction is excellent. Use of photographic engraved rollers has enabled the production of fine lines and shadow effects unattainable with conventional printing vehicles.

The ability of this type of emulsion to wet readily at high speeds has increased print production.

The penetrating properties plus the covering power of pigments allow the use of shallower engravings; thus more yards are realized per gallon and print rolls can be used for longer periods before re-engraving is necessary.

Aftertreatment of prints is limited to drying; or, where maximum fastness is required, to curing at about 350 for two minutes.

The adoption of this type of emulsion to dyeing; that is, the emulsion with the water on the inside and the organic phase on the outside, carries over all of the various characteristics which we have in printing. The excellent wetting properties have enabled the production of heavy government fabrics, tapes and ducks, and other heavy constructions, at a single pass through a padder. They wet out immediately.

* Presented at Annual Meeting, Atlantic City, N. J., October 14, 1944.

If proper pigments, and the proper binders, plus adequate curing, are employed, shades can be produced that withstand the standard tests for chlorine, dry cleaning, perspiration, fusing, scrubbing, severe washing, and gas gading.

Functional finishing compounds, such as mildew-proofing materials, are readily compatible with padding liquors. Thus it is frequently possible to dye and finish in one operation.

The second of these systems, the oil-in-water emulsion, again embraces all the desirable characteristics of pigments. Our work with this type of emulsion has not shown its use as a printing vehicle to be as satisfactory as the water-in-oil type.

Production of plain shades by this method has proven of value where equipment setups prohibit the use of solvents. The use of water as a major diluent in some cases affords an economic saving. In the case where you have a very light pastel shade, in which you would have a predominance of clear in your padding liquor, the further you go down on that cut, the more water you are carrying in. If you are operating with the other type of emulsion where the solvent is approximately 50 per cent of your diluent, then the clear naturally runs the cost up. In some cases your clear would be more expensive than the actual color involved.

The oil-in-water emulsion is generally more readily formed; also, during these times it is pretty difficult to get high-speed mixers. However, you can make this type of emulsion quite readily on the ordinary type of mixer. Cleaning of equipment is also somewhat easier. The emulsion can be easily sprayed off from the rolls with a spray of water and you save a little time there, if you are running short yardage on various shades.

The third system, the all-solvent dispersion method, is employed mainly for the production of flameproofing and mildewproofing on government fabrics, such as duck, burlap, osnaberg, and camouflaged nettings. This method affords the maximum in penetration, and also increases the drying speed, as all of the diluents are of a volatile nature. This is a very important factor in many textile plants, particularly those that are not accustomed to handling heavy government fabrics. They did not have the drying facilities to turn out a very great production with other methods.

Generally speaking, it has been our experience that the all-solvent system fails to give the maximum color value of your pigments. Color value is generally quite low. However, that is seldom the major objective whenever you choose to use this system.

The fourth system is the application of water-dispersible pigments in a proper vehicle for a specific purpose. Thus, in the case of printing, a modified starch medium, which when dried exhibits reasonable binding properties, is used for the production of cotton dress goods, shorts, shirtings; and, in the case where extreme light fastness is desired, such as draperies, this type of printing, or this type of medium, with pigments, is a very satisfactory method.

The addition of pigments to Ceglin has supplied an ideal means of high-speed production of many yards of government netting, and released valuable dyeing equipment for other essential production. When the cotton marquisette program first started, I don't know just how many various ways there were of dyeing, but I know it did tie up a lot of machinery.

When we worked out a system for adding pigments directly to Ceglin, it was all set up in a range and the production was stepped up tremendously.

Things aren't always so rosy with pigments. I was on the other side of the picture a few years ago, and I know some of the problems you fellows have, some of the questions you have in your minds. I used to ask some of them myself. I can't say that I have an answer to all of them yet, even though I have been working with a pigment company.

For instance, how can you produce dark shades, say for printing, without excessive crocking? There is no doubt they do crock. However, there are a few points which might help you to reduce this objection to a minimum. A careful survey of patterns as to size of object and ultimate consumer use will minimize this objection.

I have frequently been asked the question, How dark a shade is it safe to run with pigments? If it is a small peg color, possibly the size of the end of my pencil or something like that, I don't believe there is any restriction as to how deep a shade you can run, because that small object does not crock to any objectionable extent.

Another thing about the crocking of pigments—perhaps you all already know this, but there is no bleeding of pigment colors. You simply are rubbing excess color off the surface of the print or the dyeing, and the slight stain on the crocked fabric can be readily soaked out in a little soap and water.

If pigments are to be used, we would like very much for you to consider them as an additional tool in your range of coloring compounds. When you print a vat, you add potash and hydro to it, so that when aged a reduction to the leuco compound occurs, and all the color will at that point affix itself to the fabric.

We add resins to pigmented emulsions for exactly the same reasons—only in a physical manner. First, resins are used to produce a satisfactory printing medium; and I am sure that all of you who have used this type of emulsion for printing will agree that it is an excellent vehicle.

Secondly, after you have applied the color, we ask that you take advantage of that resin in a further manner; that is, give it a break and cure it. You have all handled resin finishes. If you cure a material printed with resin emulsions such as we manufacture, you will find that you do step up the wash fastness considerably and in some cases it does help to cut down crocking.

Another point which comes up quite frequently is the fact that production men are currently faced with the problem of new compounds coming onto the market. Some of these present an occupational hazard to employees who have to handle them. Ways and means have been devised for the handling of many of these compounds in the past. I don't believe I can recall over two or three items which have been thrown out of a textile plant because they were dangerous to use. If you need them and they are of value to you, you can work out ways and means of handling them.

The use of solvents can be fitted into your processing with just as great an assurance of safety. Trained heating engineers can supply you with accurate rates of exhaustion for your equipment to safely cover your processing. The installations which are made on suggestion of these trained engineers are so constructed as to meet the strictest insurance regulations, and they are plenty strict.

The third point which arises is the requirement of special equipment. This problem is not restricted to the use of pigments alone. Many processes, including dyeing with Indigosols and vats, are generally run on special ranges. There are many other continuous operations in a textile mill which have only shown their true value when run on the proper equipment.

A pigment range is not a mongrel piece of equipment. Not only does it afford ideal conditions for the application of pigmentic emulsions, but it also proves indispensable where various other resin finishes are to be applied. The government procurement of wash-fast water-repellent fabrics has been held to schedule in many plants due to the fact that it was adaptable to being processed on a pigment range.

The drying of textile fabrics in general, as you all know, has received a great deal of attention in the last few years. Plants which have had pigment

ranges have gained valuable information from the use of high temperature curing. In many cases they have been able to step up production in other departments from the experience they have had on these ranges.

I would like to mention in closing that the use of pigments as coloring for textiles is a growing field. We are daily learning to take advantage of their inherent value in the production of better textiles. A great deal that is now known about their application has been obtained through the close cooperation between pigment suppliers and processing plants. The Aridye Corp. has recently established an application laboratory equipped with full sized plant machinery, and looks forward to being in a position to offer more concrete data on your specific problems. A cordial invitation is extended to all printers and dyers to bring your problems up to our plant and work on our equipment.

CHAIRMAN NEWMAN: Thank you, Mr. McLean.

At this time I would like to call on Dr. Peiker of the Calco Chemical Division of the American Cyanamid & Chemical Co.

RESIN BONDED PIGMENTS, DYEING AND PRINTING OF TEXTILES

A. L. PEIKER: As to be expected, this thing has sort of happened. I didn't know what the rest were going to talk about. You probably are going to get part of the same thing four times, but you have to take it.

The technique of printing textiles with pigments as a matter of course has developed much more rapidly than the so-called mass coloring or dyeing. There are two contributing factors, one, it is much easier mechanically to apply materials by printing than it is by dyeing, and two, a factor that most of those supplying raw materials would like to cover up, is the fact that many of the shortcomings of the pigment system are accentuated when you have a completely colored fabric. Mr. McLean has already told you how to get around certain of these shortcomings in printing, but you can't use the dodge of using small objects when you dye a piece of goods.

However, the past few years have given those interested in the whole field of coloring textiles with resin bonded pigments an opportunity to really expand as far as dyeing techniques are concerned.

That part of the industry that wanted the business when the armed forces required colored fabrics, and which really did a job have, in some respects, the jump on the rest of you because while they had to overcome a tremendous number of difficulties, they did put out a tremendous yardage of goods, and they have the "know how" of applying these materials from the padder, they know how to evaporate solvents, and in many cases heat-set or cure the binders, which, as Mr. McLean has said, is necessary to get the maximum out of these resin bonded pigments.

The ideal system, I feel, for applying resin-bonded pigments to textiles would, of course, be an all-solvent system, wherein the solvent is water. This is obvious to most of you. However, the resins available for this system have not kept up in properties with the resins available for other systems of application. They have been used considerably, but I believe that their use is somewhat limited until the resin research has given us water soluble binders with the properties desired.

Going a step further, it should be obvious that lacking the ideal system the next best should be the oil in water type. I am not going to discuss the relative merits of the various systems because in most cases, you are operating with colloidal systems where the colloid behavior is more important than the ingredients you put in, and to my mind at least, it is somewhat like a political argument. You have certain views, there are practically no facts to put up to argue either way, and thus it is a rather difficult question to really debate scientifically.

We have developed a system of applying pigments from an oil and water system that has had quite extensive application, and I am going to take an opportunity, if I may, to show you a few things that have been done. Most of them, of course, are dependent upon the armed forces' requirements. A lot of you have seen nets like this but much larger. This is a shrimp net that was flameproofed, mildewproofed, and made weather resistant, the finish was applied from an oil and water system in a somewhat modified padder, because of the thickness of the material. The material is flameproofed, and I found that talking about flame resistant materials, is like waving a wet paint sign, somebody wants to try it. I am rather proud of this little net, so if anybody would care to burn something, I have a scrap up here for that purpose.

Another type of net that has been procured in fairly large amounts is the so-called helmet netting. I have a larger piece here, and also a piece that if you look closely you will see is not very well covered. That is why I got it. This is the type of netting you have seen on the boys' helmets. The helmets are wrapped over for various purposes, mainly, however, to cut down reflectance, because regardless of how flat a paint is used, the helmet still presents a reflecting surface. This material had to be mildew resistant, had to meet certain lightfastness requirements, and had to have the shrinkage controlled approximately 10 by 16. This resin treated and colored material, will give a shrinkage control of less than 10 per cent either way.

Carrying on a little further, we get to the marquisette type of cotton netting. This net not only had to be treated for shrinkage control, it also had to maintain its hand after washing. One single treatment, followed by a reasonable cure, maintains both well within specifications.

You also have the opportunity with pigments to put them on synthetics. This is a piece of nylon tricot net, done in one operation. In addition to the properties mentioned above, it was also necessary to maintain dimensional stability.

These materials are definitely uninteresting from a civilian viewpoint. We haven't been able to get the resins that we would like as freely as we would like in order to go out for field demonstrations, so we have had to play around in the laboratory. While the shades of these nets may not set any particular world afire, we have three nets here that approach shades desired by civilians. The net used here is similar to the helmet net. The range of pigments used will stand light until the fabric disappears. The choice of pigments, of course, depends upon the purpose for which you want them. You can get pigments ranging from lightfastness of 40 hours, unfortunately at the present time a larger number of the most brilliant colors fall in this range, to pigments of the type used on these nets, some of which are dull, such as we have here, but they will stand 300 hours, sometimes better. However, we feel this type of application can go into civilian use just as soon as we can get raw materials.

We have carried this thing one step forward, again in the laboratory, and I have here a laboratory dyeing of cotton jean material that was padded from an oil in water system. I hope you notice particularly, the crocking, both wet and dry. I believe this lack of crocking is quite astounding for pigment work. We also have exposed part of this material to 60 hours in the Fadeometer and washed it afterwards. If you want to examine this test piece, you will find there isn't very much break. Some of you probably know that pigments did run into that difficulty at one time.

That about concludes my talk. At the moment it looks like some of the resin materials will be much freer in the very near future, and we would definitely like

to go out and see whether our laboratory results meet your requirements. I believe they will.

CHAIRMAN NEWMAN: Thank you very much, Dr. Peiker. John L. Crist, of the Southern Dyestuff Corporation, who is also southern sales agent for Sherwin-Williams Company is present.

I would like to know if he has something in the way of recent developments that he would like to present at this time?

JOHN L. CRIST: I think the two previous speakers have covered very admirably the development to date. I do think the restrictions which were necessary by virtue of the war effort have somewhat retarded the development. I expect the development of resin bonded pigments would have been further along had it not been for some restrictions on resins, and equipment available to the finishing industry.

I think it would be hazardous to make any effort at this time to anticipate future developments, but I expect they will be greatly accelerated as soon as there is a relaxation of controls. One might speculate as to which direction this would go. There is the water in oil phase, the oil in water phase, and other systems. I wouldn't be surprised if we may have some state legislation requiring certain fabrics to be fireproofed, perhaps tenting materials, as a result of the catastrophe at Barnum and Bailey's Circus and the catastrophe that happened to the Normandie. Maybe fabrics on shipboard will be required to be fireproof as far as possible.

The organization which I have the honor of represnting has its factories just a few miles from Atlantic City, and we have here this morning a member of the Association who is also the production and development head of that unit, Max Silverman. You might ask him to make a few comments.

CHAIRMAN NEWMAN: I will now call on Mr. Silverman of the Sherwin-Williams Co.

MAX SILVERMAN: Everything has been said about the subject, at least as far as I'm concerned. It is just a case of re-emphasizing the fact that the use of pigment color is branching into flameproofing, and seems to be finding usefulness on synthetic fabrics.

CHAIRMAN NEWMAN: Mr. LaPiana of the Stein, Hall Co. is present. Would you make a few remarks?

BINDERS FOR PIGMENTS

FRED G. LA PIANA: The preceding speakers have told you about the various types of binders that are used for fixing pigments to cloth. The binder that Stein, Hall & Co. has developed, and which is sold under the trade name of Sho-Pal is a straight water soluble binder. It is a dry white powder and does not require the use of any organic solvent whatsoever.

There is no doubt that if the results obtainable with this binder were perfect under all conditions, this would be the perfect binder for textile pigments, because you can use it with the machinery or equipment you have without the need of making any changes, and because water is the most harmless and the cheapest solvent you can find under the sun.

Unfortunately, we admit that the results are not perfect in the sense that they meet all conditions. They are perfectly satisfactory only when the material is properly used for the scope and inside the limitations for which we recommend it.

We do not manufacture or sell pigments. With our binder you can use whatever pigments you choose, in the pulp or powder form, as long as they are water dispersible. It is up to you to evaluate their properties and decide which suit your conditions best, the same as you do with any other dyestuffs.

You know what starch is, of course. You are familiar with it and most of you use starch in one form or another in your plants. Our binder is based on starch. Starch is a high molecular compound, a natural polymer with numerous hydroxyl groups as component part of the very large molecule. It is through these hydroxyl groups that starch when heated with water has the capacity of absorbing and retaining large amounts of this water and so forms viscous pastes, which as you know are very useful in many textile operations for sizing, printing, finishing, etc.

If by chemical or other means we block all or most of these hydroxyl groups so they won't absorb water any more, then starch becomes insoluble. And that is what we have done in our binder. Our Sho-Pal is so treated that while it can absorb a large amount of water and form a viscous paste just right for printing when first cooked, if the film so formed and deposited on the cloth is properly dried and dehydrated it loses its capacity of again absorbing water and consequently becomes water insoluble. This is the way our binder works.

As I said before, this binder has its limitation. The principal one is the limitation on the amount of pigment that you can safely carry in a print or a dyeing. On this depends the strength of the shade as you know. You can't very well print blotches in heavy shades carrying a high percentage of pigment and not expect a lot of objectionable crocking. For fine outlines, or small peg work pigments can usually be printed in any strength, but for blotches medium or light shade only will be satisfactory.

We, of course, have done in the past and are doing now a good deal of research to improve this product especially in its crocking properties. The best results so far have been obtained by after treating the prints or dyeings with a new water soluble resin, which may be applied not only to protect the binder and pigment against abrasion, but also to impart to the cloth a very fine starchless finish.

Due to present limitations of supplies and equipment this new resin has not been offered to the trade generally and we are still experimenting in its applications in the various stages of wet processing.

Another point I would like to make is this. Pigments, in my opinion, are here to stay in the textile field, but there is no evidence that they will displace other dyestuffs in great quantities in the near future. Vat colors are going to be still the backbone of high grade workmanship, but in the cheaper lines, the percale line especially, pigments will have their place in conjunction with salt colors, rapidogens, etc.

As far as fastness to light is concerned, we know pigments are in most cases superior to other dyestuffs; as far as fastness to washing, they are quite satisfactory. If their limitation in crocking can be overcome or substantially improved, the field for their use could be greatly enlarged.

Another thing that limits their use at present is the limited range of colors that is available. We have a very satisfactory green and blue that meet all the requirements of fastness of the best vat colors and more, but we haven't a good red, and none of the yellows now on the market, in my opinion, are as fast to light as they should be. Whether the pigment manufacturers will be able to produce soon a full line of pigments that will be as good or better in fastness properties as the vat colors I don't know. I know they are working on this problem and I am sure they will have something new to offer in the post-war period.

We, too, are trying very had to make better binders. So any future improvement and expansion in this field depends not only on the work we are doing but also on what the manufacturers of pigments can put out at a reasonable price to meet the shades and the varied line that are required for a complete job.

MR. VEEVERS: I would like to inquire if anything has been done in the direction of using pigments in yarns or stock dyeing?

MR. ROBBINS: We have done quite a lot of experimental work on it. We have done satisfactory dyeing in a package machine. Unfortunately, the weaving qualities were not there due to the stiffening of the yarn, due in turn to the application of the resin. In other words, it hasn't been licked.

The other bugaboo on package dyeing is the fact that just for the sake of theory, you make up a gallon of liquor to do a pound of yarn. You consume a pound of liquor, and that is all good liquor and it must be saved. Consequently, the operation is not efficient from that angle.

JOHN BUCHERT: Is there any application to be made of these resins to warp dyeing?

MR. ROBBINS: At the outbreak of war we had two plants ready to go into production on warp dyeing. Due to the equipment necessary for making the necessary machinery, the whole project never went any further than one actual installation which was done on an experimental basis. Both those plants are in the South, and as soon as the materials are available to build the equipment, I am told they will go right into regular production operation.

CHAIRMAN NEWMAN: Do you have anything to say along that line, Dr. Peiker?

DR. PEIKER: We haven't done very much of that. I am certain it can be done. There is some question in my mind about what to do with the sizing, whether you are going to put the sizing in at the same time. It is quite a job to understand quite how it is going, but I am certain it can be done, as Mr. Robbins has said.

MR. CRIST: We find quite a bit of interest in the subject, of course, and there again you have two phases, whether you shall take a warp in open width, such, for instance, as a slasher, where you can coat each individual strand or take it in rope form, such as indigo dyeing. Work is being carried on at this time and certainly the progress will be accelerated as soon as there is a relaxing on equipment.

CHAIRMAN NEWMAN: And as soon as there is some yarn to dye.

MR. CRIST: You asked about dyeing raw stock: One would perhaps be required to let his imagination have pretty free rein to anticipate how we can handle raw stock dyed with resin bonded pigments.

HENRY K. TORPEY: We do a great deal of so-called random or spot dyeing with the needle machine. Naturally, that is with direct colors. In doing vats, we have to do them in the package and afterwards finish them in package dyeing machines. So it struck me that the Aridye would have some value in that line, give fast colors, without too much treatment.

Just before the war I ran a little of it in the all-solvent type, which of course is expensive, although the liquor can be saved from the extractor and reused, but I would very much like to go into that again and I would welcome anything that any of these gentlemen can say now or any information they could send me later which would help me along the line.

I think there are great possibilities in a certain type of yarn which we sell for hit or miss, either in one shade or possibly more than one shade on the same piece of yarn, in fast color.

MR. CRIST: One would think that perhaps the electronic drying of packages might tie pretty well into that sort of thing.

MR. ROBBINS: We haven't to my knowledge had much experience along those lines, but we certainly would like to discuss it later. I would be very happy to.

MR. BUCHERT: I wonder if there is any dyeing being done on pile fabrics, and just what effect it would have on the handle of cloth?

MR. TORPEY: I can say that the work we did do went into chenille work. It made beautiful chenille work and gave the effects on chenille bedspreads that we couldn't obtain in any other way.

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ONE HUNDRED AND FORTY-SEVENTH COUNCIL MEETING

THE Council held its 147th meeting in the Hotel Claridge, Atlantic City, N. J., on Thursday evening, October 12, 1944. Present were President William D. Appel, presiding; Hugh Christison and Charles A. Seibert, vice-presidents; William R. Moorhouse, treasurer; Louis A. Olney, chairman of the Research Committee; Carl Z. Draves, Al an Eavenson, Robert E. Rose, Thomas R. Smith and P. J. Wood, past presidents; John N. Dalton, Harry M. Hartnett and Charles H. A. Schmitt, representing Northern New England; Ben Verity representing Rhode Island; Kenneth H. Barnard, J. Robert Bonnar, J. Ernest Meili and George A. Moran representing New York; C. Norris Rabold and Raphael E. Rupp representing Piedmont; Robert W. Philip representing Southeast; Arthur T. Brainerd and Herbert W. Tetzlaff representing Mid West; Henry F. Herrmann, chairman of the Publicity and Corporate Membership Committees; Leonard S. Little, chairman of the Executive Committee for Research; Bertil A. Ryberg, Associate Research Director; and Harold C. Chapin, secretary.

The Secretary's report of the 146th Council meeting and financial report of October 5, and the Treasurer's report of October 10, were accepted. Approval by letter ballot was reported for amendments to the By-laws changing the beginning of the dues year, for Corporate members only, from November first to January first; and cancelling records of unpaid dues of individual members up to November 1st, 1944. The budget recommended by the Committee on Appropriations, for the year begun August 1st, 1944, was presented by the Chairman, William R. Moorhouse, and approved by the Council. Reports were presented by the Chairmen of the Executive Committee on Research, the Publicity and Corporate Membership Committees.

Elected to Corporate membership were:
American Textile Processing Co.
American Thread Co.
Antipyros Co.
Atlas Electric Devices Co.
Banco, Inc.
Clarence S. Brown & Co.
Brown Converting Co.

SECRETARY'S FINANCIAL REPORT—October 5, 1944

Received and transmitted to Treasurer	*Applications*	*Dues, regular and reinstate*	*Dues, Corporate and Sustaining*	*Miscellaneous*	*Totals*
Aug. 1, 1943 to June 12, 1944	$1,985.00	$13,559.63	$15,787.50	$4,567.58	$35,899.71
June 12 to July 31, 1944	177.50	60.00	14,875.00†	433.68*	15,546.18
Total for fiscal year ended July 31, 1944	2,162.50	13,619.63	30,662.50†	5,001.26	51,445.89
Aug. 1 to Oct. 5, 1944	445.00	134.50	2,925.00	397.56‡	3,902.06
Leaving deposited by Treasurer with Secretary					2,000.00

Miscellaneous items		
Year books	$63.65*	$67.15‡
Reporters	4.05	31.95
Reprints	21.00	.95
Crockmeters	115.00	169.00
Crock cloth	12.00	32.08
Multi-fiber test cloth	—	12.00
Moth cloth	—	2.50
Water test apparatus	70.00	17.00
Dyed standards	15.00	15.50
Knitted tubing	.50	22.50
Gas fading blue prints	.98	1.00
Buttons	1.50	9.00
Launderometer royalties	90.00	—
Publicity pamphlet	—	.25
First National Bank dividend	40.00	—
Refund, Olney Medal expense	—	16.68
	$433.68	$397.56

† Including $10,000 from the International Salt Co. for a special research.

Burlington Mills Corp.
John A. Cairns & Co.
Cantor Greenspan Co.
Cliffside Dyeing Corp.
Diamond Alkali Co.
N. Erlanger Blumgart & Co.
Exeter Manufacturing Co.
E. & W. Dyeing Corp. of N. J.
Gaede Dyeing Co.
General Aniline & Film Corp.
Hohokus Bleachery
Hornell Industries
Hudson Piece Dye Works
Inter-state Dyeing & Finishing Corp.
Arthur Kahn Co., Inc.
Kingsboro Silk Mills
Lynn Dyeing & Finishing Co.
Mohawk Carpet Mills
Dyer S. Moss
New York Section, A.A.T.C.C.
Nova Chemical Corp.
Onyx Oil & Chemical Co.
Pyramid Piece Dye Works
Sea Island Mills
Seyer Silk Dyeing & Finishing Co.
Seymour Woolen Mills
Alexander Smith & Sons Carpet Co.
Spevack & Garbaccio
A. Steinam Co.
S. Stroock & Co.
Swift Manufacturing Co.
Traub, Lyons Oppenheim, Inc.
Tryon Processing Co.
Uxbridge Worsted Co.
Wannalancit Textile Co.
Waldrich Co.

Each of the following was elected to the class of membership specified, as of 30 days from publication of application, provided no objection be received meanwhile by the Secretary.

SENIOR

E. Abrams
E. R. Adair
U. S. Almond
W. B. Amos
J. R. Armstrong
W. Ashkanozy
E. C. Atwell
P. A. Audet
F. O. Bauer
J. Bauer
H. A. Benjamin
M. Bergman
J. A. Bjorksten
J. J. Bloetjes
E. O. Buckner
G. G. Byler
W. M. Campbell
C. G. Carey
F. Caron
A. Cupo
J. S. Dahle
L. W. Davis
E. F. Dohner
S. M. Fragala
M. R. Freney
J. W. Gaffney
L. C. Galatioto
F. Gay
A. Gellene
G. J. Gorman
I. Gubelmann
A. Gurdjian
A. Hasner
F. A. Hempel
P. S. Hewett
L. M. Hobbs
A. G. Hovey
E. T. Howell
G. W. Ingle
A. E. Irvine
A. J. Johnson
F. C. Jones
J. S. Kane
W. J. Kapinos
E. H. Keys
E. King
Wm. Kirk
J. Kluthe
E. E. Knapp
R. R. Kolb
W. A. Koos
P. P. LaFontaine
A. Leith, Jr.
J. W. Lipp
E. L. Manchester
A. H. Marks
J. F. Melody
J. A. Moore
L. Morris
W. L. Moudy
H. R. Murdock
D. Nickerson
J. Nieman
L. Noguier
C. Otto
W. C. Parker
J. A. Placella
J. Polak
M. J. Quigley
P. Raffin
W. E. Remblad
L. C. Reynolds
A. E. Rhodes
F. V. Rice
B. F. Rivers
E. G. Robinson
C. F. Russell
E. J. Sands
J. J. Scarborough
T. Scheuermann
M. Scott
H. P. Shultz
J. F. Smith
R. R. Smith
A. B. Snowdon
M. L. Staples
M. M. Swartz
H. F. Taylor, Jr.
N. J. Timmons
J. Vadas
J. J. Walker
T. J. Walsh
W. R. Wands
W. E. Wanstall
M. Weitzman
L. H. Wheeler
A. C. Whitford
V. Woodside
G. A. Wolf
E. A. Wolfenden

JUNIOR

E. Cami
A. G. Hoyle
J. D. Joffe
E. M. Stromwall, Jr.
F. A. Tranfaglia

ASSOCIATE

H. V. Ackerman
F. G. Clark
W. T. Green
S. H. Hart
D. Mejia
J. W. Stribling
J. J. Sullivan

STUDENT

A. Roth
C. H. Soto

From other classifications, H. M. Olson and B. J. Morway were transferred to Senior membership.

Respectfully submitted,
Harold C. Chapin, *Secretary*.

MEMBERSHIP APPLICATIONS

SENIOR

Frederick W. Adams—Research Director, Clark Thread Co., New York, N. Y. Sponsors: E. R. Schwarz, K. R. Fox, T. F. O'Brien.

Eugene Paul Bebeau—Supt. of Dyeing & Finishing, R. & D. R. Cotton Mills, Danville, Va. Sponsors: G. R. Murphy, Jr., J. R. Morton.

J. William Bordner—Textile Chemist, Frederick H. Levey Co., Brooklyn, N. Y. Sponsors: E. L. Duhring, M. Gordon.

Reinhard Born—Finisher, Putnam Woolen Corp., Putnam, Conn. Sponsors: A. J. Midwood, J. J. Solodyna.

Robert F. Brown—Sales Service Supervisor, Emery Industries, Inc., Cincinnati, Ohio. Sponsors: C. W. Sampson, N. A. Ruston.

Leland H. Burt—Chemist, Hercules Powder Co., Wilmington, Del. Sponsors: F. U. Rapp, A. R. Olsen.

William Roy Castle—Finishing Overseer, R. & D. R. Cotton Mills, Danville, Va. Sponsors: G. R. Murphy, Jr., J. R. Morton.

Joseph W. Conklin—Formula Man, United Piece Dye Wks., Lodi, N. J. Sponsors: M. K. Emerson, W. Opdenbeck.

Kenneth W. Coons—Head, Dept. Chem. Eng., University of Alabama, Tuscaloosa, Ala. Sponsors: C. A. Jones, G. E. Missbach.

Roy T. Cowing—Tech. Field Representative, Monsanto Chemical Co., Chicago, Ill. Sponsors: E. F. Smith, L. B. MacFarland.

Norman B. Edelman—Technologist, Quartermaster Depot, Philadelphia, Pa. Sponsors: L. I. Weiner, S. Backer.

William S. Johnson—Overseer of Raw Stock Dyeing, R. & D. R. Cotton Mills, Danville, Va. Sponsors: G. R. Murphy, J. R. Morton.

Walter J. Kaderabeck—Textile Colorist, National Aniline Div., Allied Chem. & Dye Corp., Buffalo, N. Y. Sponsors: T. F. Murphy, C. E. O'Connell.

William P. Kampf—Salesman & Treas., H. D. Kampf Sons, Inc., Brooklyn, N. Y. Sponsors: W. D. Thompson, L. W. Craft.

Frederick H. Kranz—Research & Development Dept., National Aniline Div., Allied Chem. & Dye Corp., Buffalo, N. Y. Sponsors: T. F. Murphy, M. A. Cullen.

Isadore Kuchinsky—Chief Chemist & Supt., McCarty Aniline & Extract Co., Paterson, N. J. Sponsors: W. D. Thompson, H. P. Baumann.

John W. Maher—Supt. of Dyeing, River Mills, Inc., Fall River, Mass. Sponsors: W. S. Chapin, J. H. Gormley, Jr.

Max E. Mueller—Textile Technician, Stonecutter Mills Corp., New York, N. Y. Sponsors: O. F. Marks, E. Driscoll.

David M. Norket—Dyer, Burlington Mills, Yarn Dyeing Dept., Burlington, N. C. Sponsors: J. B. Neely, R. A. Bruce.

Charles E. Post—Textile Chemist & Colorist, Phoenix Color Div., Aridye Corp., Paterson, N. J. Sponsors: T. Rusticus, G. S. Garvin.

Lawrence E. Schall—Chemist & Foreman Dyer, Textileather Corp., Toledo, Ohio. Sponsors: J. W. Eich, F. Furchland.

William C. Snead—Dyer, Textileather Corp., Toledo, Ohio. Sponsors: J. W. Eich, F. Furchland.

Richard Van Hoff—Chemist, Phoenix Color Div., Aridye Corp., Paterson, N. J. Sponsors: T. Rusticus, K. L. Dorman.

Edward L. Whitford—Manager of Rayon Dept., A. Steinam Co., Inc., New York, N. Y. Sponsors: H. R. Mauersberger, A. A. Wachter.

Willard Palmer Whitlock, 3rd—Research & Standards Br., Bur. of Ships, Navy Dept., Washington, D. C. Sponsors: W. D. Appel, A. L. Smith.

GLYCERINE IN TEXTILE PROCESSES

GEORGIA LEFFINGWELL, Ph.D. and MILTON A. LESSER, B.Sc.

THE statement by the War Production Board[1] that "glycerine is vitally necessary in military dyes" illustrates but one of its many uses. Even under war time conditions, tremendous quantities of glycerine went into textile processing. Government statistics[2] show that during 1943, 2,242,000 pounds were allocated for such purposes. Estimated consumption for the year 1944 indicated that an additional quantity of more than a quarter of a million pounds of glycerine will have been consumed by the textile industry, or a total for the year of 2,500,000 pounds.

The need for glycerine in the textile industry rests in its unique combination of physical properties.[3,4,5,6,7] Hardly a phase of modern textile processing fails to benefit from one or more of these characteristics.

Let us now review some of the details on which the foregoing claims are based: Glycerine is widely used as a lubricant or as a constituent of lubricating mixtures. Yates[3] cites work by Schofield in which it was tried as a wool lubricant in order to obviate contamination of the materials by the ordinary oiling methods. The final results were shown to have a high degree of cleanliness. In addition the use of glycerine eliminated static electricity trouble in the carding room. Long employed in lubricating compounds, glycerine continues to be specified in new products for conditioning textile materials to improve their workability.[8]

As a hygroscopic agent and softener, glycerine is a standard ingredient of sizing compositions. Stressing that the proper choice of softeners is as important as the correct selection of the sizing material itself, a report of the U. S. Institute of Textile Research,[9] cites the example that a starch-glycerine combination gives higher cohesion and stiffness than a starch-sulfonated oil combination. Russian studies[10] of the use of soluble starches in sizes have similarly shown that the addition of glycerine as a softener is beneficial.

Glycerine prevents the starches and sizes from becoming too dry and dusting out. According to Yates,[3] this fluid also counteracts any drying action which is likely to occur during the actual manufacture of a fabric. He points out that woolen yarns often require sizing to facilitate better workability and for such purposes glycerine and Tragon mixtures have been found to be most effective. Illustrative is the following size for soft botany yarns:

Tragon	6 lb.
Glycerine	3 lb.
Water	50 gal.

Sizing compositions for other types of materials similarly call glycerine into play, as in the following preparation recommended by Speier[11] for 100 per cent viscose rayon staple:

Water	100 gals.
Potato starch	50 lbs.
Glycerine	8 lbs.
Caustic soda solution	1 lb.

Glycerine finds very extensive employment in the preparation of printing pastes; its use permitting the formation of dyestuff pastes with excellent workability. It promotes fixation and, when ageing conditions are on the dry side, its moisture retaining and absorbing properties come into action. According to Quinn,[12] the addition of glycerine to printing pastes will increase the color yield and the uniformity of almost any color that is later to be either acid- or steam-aged. As an example, he remarks that occasionally Indigosol prints show poor color yield and unevenness after ageing. To overcome this condition, such goods are aged a second or even a third time. Investigations have shown that such faults are due to the lack of sufficient moisture in the steam that is being fed into the ager. In such cases, the addition of glycerine and a trace of copper sulfate (as a catalyst) will yield much fuller prints than obtained in the first instance. Similarly, in his discussion on the printing of wool, Furlonger[13] suggests that glycerine may be used for colors that do not behave well on steaming. Many examples of its employment in textile printing pastes are available in the technical literature including patent specifications[14,15] and research reports.[16] Yates[3] presents a print paste formula for the alkali carbonate process for vat dyestuffs:

Dyestuff paste	20 parts
British gum thickening	51 "
Potassium carbonate	14 "
Formosul	10 "
Glycerine	5 "

Glycerine is also a constituent in the preparation of a reduction paste which is used in conjunction with the above:

Glycerine	5 parts
Potassium carbonate	10 "
Formosul	5 "
British gum thickening	80 "

Glycerine is extensively employed in printing paste thickenings to make certain that the fabric holds a suitable amount of moisture while passing through the ager, because color development does not take place if the fabric is too dry at this stage. Hoyle[17] gives the following as the compositions of typical thickeners which have proved satisfactory on large scale usage. The first is for thickening a strong printing paste, while the second is used for making a weak printing paste:

	I	II
British gum	5 oz.	5 oz.
Wheat starch	14 oz.	12 oz.
Potassium carbonate	1¾ lb.	8 oz.
Glycerine	¼ pt.	3/16 pt.
Olive oil	¼ pt.	3/16 pt.
Formosul (sodium formaldehyde sulfoxylate)	1¼ lb.	6 oz.
Water, to make	1 gal.	1 gal.

To make a strong printing paste, there is used 3 parts of the thickening and one part of the vat dye paste; while, for a weak color, the strong color paste is suitably diluted with the thickening.

Glycerine serves similar functions in thickening agents used in the screen-printing of fabrics, more especially rayons. It aids in fixing the dyestuff on the fiber during the steaming process, and also helps to obviate drying-in or clogging of the mesh in metallic screens.[18]

Newer studies on methods for printing pile fabrics, call glycerine into frequent use. A recent discussion on the printing of rayon velvets,[19] points out that the fluid is frequently put into the discharge color in order to overcome excessive loss of moisture at the areas on the pile where the color has been applied. Such a loss of moisture is liable to occur when the pieces are dried out under heat, before being steamed after application of the discharge color, sufficient time then not being allowed for reabsorption of atmospheric moisture before going to the steaming unit.

Thus, glycerine is recommended by Ferre[20] in several of the preparations used for printing imitation fur effects on plush; the following being a typical recipe for a block printing dye:

Acid dye	310 Gm.

Powdered British gum	325 Gm.
Glycerine	75 Gm.
Potassium chlorate	25 Gm.
Sodium oxalate	130 Gm.
Ammonium hydroxide	130 cc.
Water	5 liters

Glycerine finds use in a fairly recent improvement in textile printing; which consists of the application of a resistant to fabrics to produce halftones, mat effects or the like. The resistant may be underprinted or overprinted, and it prevents the printed color from penetrating the textile or devloping to the same extent as an untreated or non-reserved parts. A suitable resistant for this purpose, according to the patent,[21] consists of:

Albumin	50 parts
Titanium dioxide	160 "
Barium chloride	75 "
Sodium sulfate	50 "
Glycerine	50 "
Castor oil	30 "
Gum tragacanth, 6%	260 "
Water	325 "

The addition of a discharging agent, such as a hyposulfite, produces white effects on colored backgrounds.

As with printing processes, glycerine has long found many useful roles in fabric dyeing. Newer work reported from many parts of the world, including patent sources, indicates the constantly growing range of glycerine's utility in improved or modified dyeing methods.[22,23,24] Russian investigations[25] on the dyeing of fabric made of combed wool and synthetic fibers illustrate the international status of glycerine in the textile field. In these studies, a fabric containing 15 per cent cuprammonium fiber and 50 per cent mestizo wool was dyed with Sulfur Black ChF in the presence of sodium sulfide 60 per cent (dye basis), sodium chloride 10-15 per cent, joiner's glue 1-2 per cent and glycerine 1-1.5 per cent (fabric basis); the maximum dyeing temperature being 20°C. With this procedure the cuprammonium fiber dyed evenly throughout the fabric and the finished fabric looked normal and was soft and elastic. It was found that the use of glycerine produces a more intense color than did the use of joiner's glue alone.

Glycerine also finds use in many varied special finishes or treatments to impart certain desirable characteristics. In the delustering of rayon with tin compounds, for example, the uniform precipitation of barium stannate is assisted by an addition of glycerine. In this case it is possible to use one bath instead of two separate baths.[26] Conversely, if acetate rayon goods have been slightly delustered during dyeing or finishing, as by the application of excessively high temperatures, they can usually be improved by a treatment in an aqueous alcohol solution to which a small amount of glycerine has been added.

Employed as a plasticizer, glycerine has been used in conjunction with silicates, borates or stannates in the creation of creaseless or crease-resistant finishes made without recourse to resins.[27,28] Of pertinent interest is a European report[29] on the use of glycerine in a process for increasing the wearability of fabrics. It has been found that fabrics which are brittle and lack fats may be treated with glycerine on a machine which regulates the amount of this fluid to be applied to the textiles. Not only does such glycerine treatment improve the wearing qualities, but the feel of the goods is improved at the same time.

No attempt has been made in this paper to discuss the role played in the treatment of textiles by the modern alkyd or glyceryl phthalate resins. These glycerine utilizing resins have found so many diverse and important uses in modern textile finishes that they warrant a separate discussion of their own.

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TRADE NOTES • NEW PRODUCTS

• OFFICERS, A.A.T.T.

As noted in our January 29th issue, Carl I. Taber has been elected president of the American Association of Textile Technologists for the coming year. Other officers elected were as follows:

First Vice-President — Ephraim Freedman, R. H. Macy & Co.

Second Vice-President—George Linton, Central High School for Needle Trades.

Secretary — Bernice Bronner, American Standards Association.

Treasurer — Ralph Gutekunst, Hellwig Dyeing Corp.

Board of Governors — Lieut. W. F. Macia, Brooklyn Naval Clothing Depot; Richard S. Cox, Philadelphia Textile Institute; Stephen S. Marks, *Daily News Record*.

Auditors — Mark Sharples, Burlington Mills Corp.; Fred Smith, A. D. Juilliard & Co.; Samuel Williams, *Rayon Textile Monthly*.

• ELECTED FELLOW OF T. I.

G. H. Hotte, Technical Director of the Fine Goods Division of Wellington Sears Company, Boston, Mass., has been elected to Fellowship in the Textile Institute, England. Mr. Hotte is a graduate of the New Bedford Textile School and obtained his Master's degree at the Massachusetts Institute of Technology. In addition to being a member of the Textile Institute, he holds membership in the American Association of Textile Technologists, American Association of Textile Chemists and Colorists, The Textile Research Institute, and Committee D-13 of the A.S.T.M.

For three years Mr. Hotte was Research Assistant in Textile Microscopy on the staff of M.I.T. and then spent four years as Research Textile Technologist with the Firestone Tire & Rubber Company at Akron, Ohio. He joined Wellington Sears Company in 1938 as Research Director.

• BOOKLET ON VIOLITE

Rhode Island Laboratories, Inc., of West Warwick, R. I., manufacturers of luminescent pigments which are marketed under the trade name of Violite, has published an interesting booklet offering an extensive study for the post-war uses of these pigments. The booklet contains many illustrations showing how these pigments may fit into the post-war picture of many and varied industries. It is designed to stimulate post-war considerations in many fields including plastics, automotive, advertising, safety devices, textiles, jewelry, electrical appliances, and many others.

Copies are available upon request.

• PERSONNEL ADVANCEMENTS AT WARE SHOALS

The Ware Shoals Manufacturing Company recently announced that James W. Harrell, Superintendent of the Bleachery, had been appointed to the newly created

position of Assistant General Manager. Three other well-known Ware Shoals men have also been advanced.

Mr. Harrell's former position as Bleachery superintendent will be filled by C. K. Brooks, who previously served as assistant superintendent. Mr. Brook's old position will be filled by S. B. Carson, formerly overseer of the vat dye department, and his assistant, R. F. McKown, will now be overseer. Mr. McKown's previous position as assistant overseer of the vat dye department will be left vacant temporarily.

• REGIONAL MEETINGS ON TEXTILE RESEARCH

Textile Research Institute will present a series of reports on current textile research at regional meetings to be held in April at textile mill centers in several states.

The meetings are designed especially for mill engineers and technical men in the local areas, and all are invited, but only a limited number from outside the local trading centers can be admitted. In order to cooperate with the Office of Defense Transportation, the Institute has planned these regional meetings so that the reports may be heard by as many textile workers as possible with a minimum of travel.

Research papers to be read at each meeting are:

"Abrasion Test for Textiles," by Dr. A. C. Walker, Bell Telephone Laboratories, Murray Hill, New Jersey.

"Methods of Increasing the Productivity of Cotton Cards," by Elliot B. Grover, head, Yarn Manufacturing Department, North Carolina State College School of Textiles, Raleigh, North Carolina.

"Practical Applications of a New Analysis of Equilibrium Regain Data for Textile Fibers," by John C. Whitwell, associate professor, Department of Chemical Engineering of Princeton University, and member of the Textile Research Institute staff.

"Infra-Red Drying of Textile Materials," by Richard H. Wilhelm, associate professor of chemical engineering at Princeton University, and member of the Textile Research Institute staff.

Opportunity for discussion of the subjects covered in the papers will be provided at each session.

The meetings will be held in Atlanta, Georgia, at the Georgia School of Technology, Monday, April 9, in two sessions —10:30 a.m. and 2:00 p.m.; in Spartanburg, South Carolina, at the Cleveland Hotel, Wednesday, April 11—2:30 and 7:30 p.m.; and in Raleigh, North Carolina, at the North Carolina State College School of Textiles, Saturday, April 14—10:30 a.m. and 2:30 p.m.

With the exception of "Methods of Increasing the Productivity of Cotton Cards" all of the papers will be repeated in Philadelphia, Pennsylvania, at the Philadelphia Textile Institute, Thursday, April 26, at 1:30 p.m.

Inquiries about the program should be addressed to Giles E. Hopkins, Director of Applied Research, Textile Research Institute, 10 East 40th Street, New York 16, New York.

• VICE-PRESIDENTS OF SONNEBORN

The election of Dr. F. W. Breth and Gustave Schindler as vice-presidents of L. Sonneborn Sons, Inc., oil refiners and manufacturers, has been announced by Dr. Ferdinand Sonneborn, president.

Dr. Breth, who will serve as vice-president in charge of manufacturing, joined L. Sonneborn Sons, Inc., in 1915 as chief chemist and was later named technical director, a post he has held for many years.

Dr. F. W. Breth

Mr. Schindler, who is 35 years of age, comes from a family of oil refiners. Recently, Mr. Schindler has served as president of Petroleum Specialties, Inc., New York City, an organization which he

Gustave Schindler

founded in 1939. This firm has been instrumental in the market development of various petroleum derivatives originating with several U. S. refiners, including Sonneborn. Mr. Schindler will continue as president of Petroleum Specialties, Inc.

• JOINS ARNOLD, HOFFMAN

Bart Sheehan has resigned from the Grasselli Chemicals Department of E. I. duPont de Nemours & Co., to become affiliated with the Metropolitan New York sales department of Arnold, Hoffman Company. In his new capacity, Mr. Sheehan will work directly under J. B. Henriques, vice-president of the Arnold, Hoffman Company, located in their New York office in the Empire State Building.

• STEIN-HALL COMPANIES MERGE

Stein, Hall & Co., Inc., New York, and its wholly-owned subsidiary, Stein, Hall Mfg. Co., Chicago, are now being operated as a single company under the name of the former. Conducted substantially under the same management for many years, the two companies have been combined for the purpose of more efficient operation.

Stein-Hall's home office continues at 285 Madison Ave., New York, and the Chicago office and factory continue at 2841 South Ashland Ave. To provide New York office space for reorganized and expanded industrial selling and product supply departments, the New York laboratory will be moved to Stein-Davies Co., Long Island City, N. Y., the company's gum and adhesive factory, where it is planned to centralize the company's laboratories. In addition to the present production control and food laboratories, there will be adhesive, paper, textile and starch research laboratories. Service laboratories will continue to be maintained at Chicago on food, adhesive and production control, and at Providence, R. I. and Charlotte, N. C., on textiles.

• "E" AWARD TO NUODEX

Stressing the splendid job of production accomplished by the workers, and warning of any possible let down in view of the tremendous task still in front of our fighting forces, Army and Navy officials presented the "E" Flag and Pins to the men and women of Nuodex Products Co., Inc., Elizabeth, N. J., at ceremonies held Friday afternoon, February 23rd, at the Elizabeth Carteret Hotel, Elizabeth, N. J.

Lt. Col. Harold R. Giblin, Q.M.C., Procurement Division, Jersey City Quartermaster Depot, presented the "E" Award to the company. The flag was accepted for the company by Leo Roon, President.

Citation of the Award was made by Lt. Commander Thomas J. McElroy, U.S.N.R., Third Naval District, New York.

Presentation of the "E" Pins was made by Sgt. Joseph Santucci, veteran of World War II to William F. Northerner, representative of labor, and John J. Donlin, management representative. H. M. Johnson, Vice President in charge of sales of the company, acted as master of ceremonies.

• JOINS WILSON-MARTIN

Captain Francis T. Quinlan, CWS, for some years a member of the Philadelphia Section of the A.A.T.C.C. recently has been relieved of active duty with the U. S. Army and has become associated as an executive in the offices of the Wilson-Martin Division of Wilson & Company whose plant is located in Philadelphia.

Capt. Francis T. Quinlan

He is well known to many in the textile field, having been for many years in the specialty oil business.

He resigned from his former position of Secretary of Amalgamated Chemical Corporation in 1942 to enter service.

• NATIONAL COTTON WEEK

Because of the enormous diversion of cotton goods into war uses, National Cotton Week this year will not be observed in the usual manner, according to a joint announcement by its sponsors, The Cotton-Textile Institute, Inc. and National Cotton Council.

Instead of promoting the sale of cotton goods to the consumer, the period from May 20 to 26 this year will be devoted to stressing the military importance of cottons, will explain to consumers the reasons for shortages of many staple items and will emphasize the need for conservation and careful buying.

Printed material to be circulated among retailers and consumers will be written around the theme "Cotton Is Fighting Now! But Better-Than-Ever Cottons Will Be Yours Quickly . . . After the War!"

• CALCO FACTORY SITE

American Cyanamid Company has just announced the purchase for the Calco Chemical Division of a factory site along the Ohio River, near St. Marys, West Virginia. Consisting of 800 acres of land, the site is 16 miles northeast of Parkersburg, 75 miles north of Charleston, and 12 miles from Marietta, Ohio.

Acquisition of this plant site is an important addition to the Calco Chemical Division and will provide a location for the development of new products whose basic raw materials are available in the Ohio Valley trade center. It will also enable the Calco organization to broaden its activities through the introduction of new products developed by the Cyanamid organization at Stamford, Connecticut, as well as those developed by Calco's own research group.

Because of wartime restrictions on building, management is not yet in a position to determine when building will be started on the new plant site.

• JOINS BUTTERWORTH

Wallace Taylor, former sales manager of Textile Finishing Machinery Company in Providence, R. I., is now associated with H. W. Butterworth & Sons Co. He is working out of both Philadelphia and Providence offices.

• GLYCO BULLETIN

The Glyco Products Co., Inc., 26 Court Street, Brooklyn 2, New York, announces the publication of a 16-page bulletin entitled, "A High Melting Point Synthetic Wax." This gives detailed information on the high melting point synthetic wax produced by the Company under the name of Acrawax C.

The properties of this wax are listed and indexed in the bulletin, and a great many of the specific applications of the wax are mentioned in detail.

A copy of the bulletin will be mailed free to any chemist or technical worker who desires the same.

• CLASSIFIED ADVERTISEMENTS •

POSITION WANTED: Experienced research chemist, M. Sc., B. Sc., qualified to direct program connected with the development, analysis and production of textile chemical specialities, such as cationic softeners, synthetic detergents, mercerizing assistants, wetting agents, printing auxiliaries, dye penetrants, resins, non-ionics, etc. Salary required $6500 plus bonus arrangement. Box 662.

POSITION WANTED: Textile colorist and dyer B. S. degree. Honorably released army officer available for immediate employment as dyer or assistant dyer. Thirteen years practical dyehouse and laboratory experience. Thorough knowledge of direct, direct developed, sulfur, naphthol and vat color dyeing. Beam, package and rawstock machines, also some piece goods dyeing and bleaching experience. Will consider salesman-technician position. Box 663.

POSITION WANTED: Manager or superintendent of production in the dyeing, printing and finishing field, thoroughly experienced, mature judgment, full knowledge of trade requirements. Will consider representing and demonstrating finishing products of responsible chemical concern. Box 664.

POSITION WANTED: Textile chemist, 28, 2B, M.S. in chemistry, 8 years industrial experience including 4 years as chief textile laboratory of large fabric firm and one year research textile chemical manufacturer. Knowledge of all phases of wet processing-publications-research cellulose, surface active materials, dyes, special finishes; knowledge plastics. Desires to join staff of finishing plant or progressive chemical manufacturer. Immediately available. Work must be essential. Please state approximate salary in reply. Box 665.

WANTED: Man to take charge of quality testing laboratory, experience with cotton and synthetic textiles desirable. Work will include physical and chemical analysis in relation to research and development and promotional activities of national service organization. Location Dallas, Texas. Write including education, experience, and expected salary range. National Cotton Council of America, P. O. Box M, University Station, Austin, 12, Texas.

ADDITIONAL CLASSIFIEDS ON PAGE XXXII

NOTE

Essential employees need release statement. Employees who are to be hired for critical occupations need release statement and U. S. E. S. consent.